Technical Publication

INSTRUCTIONS

4530K10-701

TYPE 520
STRIP-CHART
MILLIVOLT AND/OR
TEMPERATURE
RECORDER
WITH CONTROL INITIATORS

MP MASTER
MA32569

GENERAL ELECTRIC

CONTENTS

General Electric Company

INSTRUCTIONS

4530K10-701

TYPE 520
STRIP-CHART
MILLIVOLT AND/OR
TEMPERATURE
RECORDER
WITH CONTROL INITIATORS

IMPORTANT

Supply parts for the instrument covered by this publication and additional copies of this publication, must be ordered through the nearest General Electric Sales Office or Distributor.

PRINTED IN U.S.A.

(TO BE COMPLETED BY USER)

MODEL NO: _____
SERIAL NO: _____
CHART NO: _____
RANGE: _____
DETECTOR: _____
USER I. D. NO: _____

INSTALLATION DATE: _____
LOCATION: _____
OTHER: _____

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Specific Information Publications

Millivolt and/or Temperature Measurements 4530K42-001

Alarm or Control-Initiation Wiring Diagram 4530K45-001

General Information Publication

Type 520 Strip-chart Recorders 4530K40-001

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

INSTRUMENT DEPARTMENT, GENERAL ELECTRIC COMPANY, WEST LYNN, MASS.

INSTRUCTIONS

198 4530K42-001B
Supersedes 4530K42-001A

MILLIVOLT AND/OR TEMPERATURE MEASUREMENT

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INTRODUCTION

This publication pertains to the measuring circuit used in the measurement and recording of millivolts and/or temperature (when a thermocouple is used as the primary detector) in recorders such as the General Electric Types 520 and 521.

The parts identified in this publication and their location in the recorder are shown or indicated in the recorder General Information publication.

OPERATION

INITIAL OPERATION

The initial-operation procedures specified in the recorder General Information publication should be followed. In addition, on thermocouple input recorders the following adjustment of the thermocouple feature must be made.

Thermocouple-break Feature

A temperature recorder has a thermocouple-break circuit which will drive the pen pointer to either scale extreme (up or down scale) in the event that the input-signal circuit (or thermocouple circuit) is open. If this feature is desired (and not operating), perform the following steps:

1. Place the recorder power switch in the OFF position.

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GENERAL ELECTRIC

2. Remove the two screws securing the reference board; tilt board out for access to the rear of the board.

3. Connect the leaf-type jumper on the rear of the board to drive the pen pointer up scale or down scale, or to eliminate the feature, as follows:

a. To drive the pen pointer up scale, connect the jumper between "U" and "N". (Note: This is the connection made as the recorder is shipped from the factory.)

b. To drive the pen pointer down scale, connect the jumper between "N" and "D".

c. If the thermocouple-break feature is not wanted, rotate the jumper so that neither "U" nor "D" is connected to "N" and tighten the "N" screw (or remove the jumper entirely).

4. Replace reference board.

Note: The thermocouple-break feature introduces a maximum error of ±0.2% with a 300-ohm external circuit resistance (input source impedance). If desirable, this error can be removed by recalibration as directed in the Maintenance Section.

PRINCIPLES OF OPERATION

Fig. 1, which is a functional-schematic diagram of a typical potentiometric recorder, will assist in understanding the operation of a millivolt or temperature recorder.

The d-c millivolt signal from the measured source (or from the thermocouple) is applied to the input terminals of the potentiometric measuring circuit. The magni-

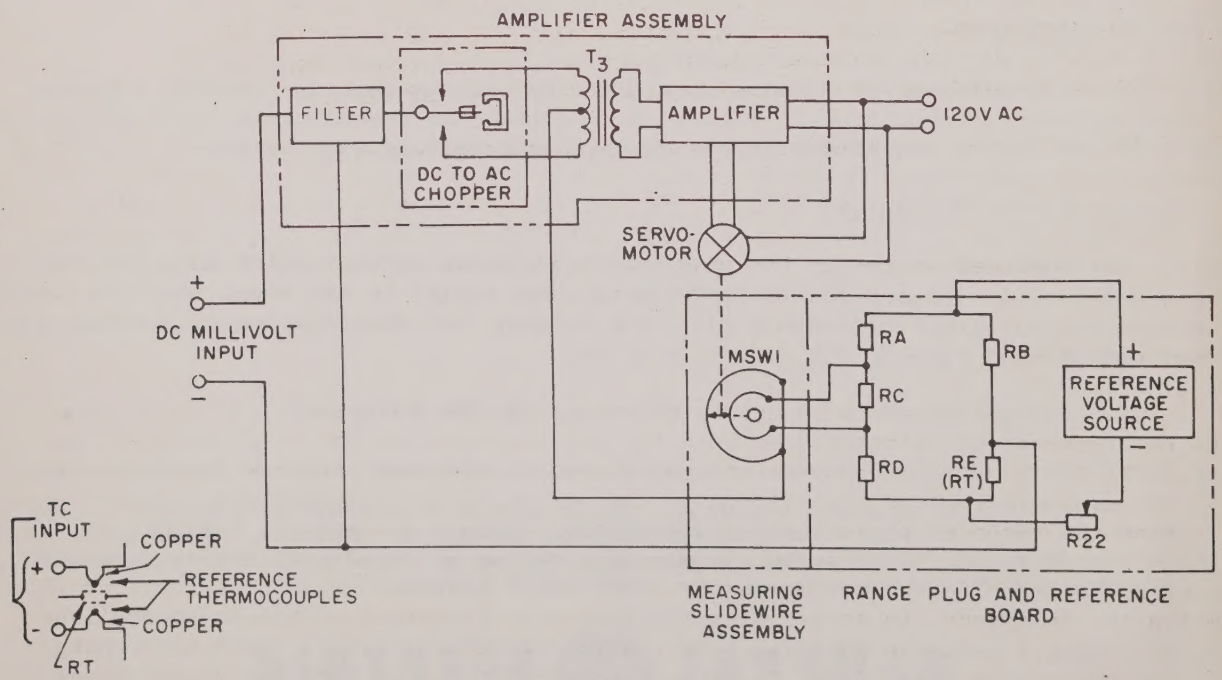


Fig. 1. Functional-schematic diagram of typical potentiometric recorder

tude of this signal is compared with a known or reference voltage. The difference between the unknown signal voltage and the known reference voltage is called the "error" voltage and is applied alternately, by the chopper, to each half of the input-transformer primary. The resulting a-c voltage appearing at the secondary winding of the input transformer is amplified and applied to the control windings of the servomotor. This causes the servomotor to rotate in the appropriate direction so as to reposition the contact arm of the measuring slidewire until the error voltage is "nulled" or reduced to zero, thus restoring the measuring circuit to a balanced condition. This balancing action is continuous and begins with the slightest change in the millivolt input from the measured source.

MEASURING CIRCUIT

The measuring circuit is composed of precision resistors RA, RB, RC, RD, RE, and double-slidewire assembly MSW1 (see Fig. 1). Resistors RA, RB, RC, RD, and RE are range resistors whose resistance values determine the millivolt range of the measuring circuit. These range resistors are mounted in a single range plug on the reference voltage wiring board (reference board) to facilitate changing the range of the measuring circuit. Potentiometer R22 (SPAN) is a trimming potentiometer which is used to adjust the scale span. The voltage drop across the measuring slidewire in the double slidewire assembly represents the full-scale span of the measuring circuit, and the position of the sliders determines the millivolt "output" of the slidewire in percent of span. The other slidewire, which is short-circuited at the ends, is used as a slip-ring contact for the slider brushes.

TEMPERATURE RECORDER

Temperature recorders of the thermocouple type are similar to millivolt recorders except that resistor RE (in the measuring-slidewire assembly) is replaced by an assembly consisting of a temperature-sensitive resistor (RT) and two special "reference" thermocouples. Although these thermocouples are physically imbedded in the temperature-sensitive resistor (RT), they are electrically connected in the recorder input circuit. The two thermocouples, in conjunction with the action of the temperature-sensitive resistor, provide automatic cold-junction compensation. This cold-junction compensator is located on the terminal board at the rear of the case.

The two reference-thermocouples are made of copper and the two thermo-electric materials for which the recorder is calibrated. For example, in a recorder calibrated for use with a Chromel-Alumel thermocouple, the reference-thermocouples are copper-Chromel and copper-Alumel. Since each thermocouple has copper as one material, the combined action of the two reference-thermocouples is that of a single thermocouple made solely of the two materials for which the recorder is calibrated. This equivalent single thermocouple is the cold or reference "junction" of the measuring system.

Since the millivolt output of a thermocouple measuring-system is proportional to the temperature difference between the hot junction and the cold junction, any increase in the ambient temperature (of the cold junction; the hot junction being at the measured temperature) decreases the output of the thermocouple circuit, thus causing the recorder to indicate a false decrease in temperature. However, in these recorders the decrease in thermocouple output is exactly offset by a corresponding increase in the voltage drop across the temperature-sensitive resistor (RT) which is, in effect, in series with the thermocouple output. This is accomplished by selecting a suitable positive temperature-coefficient for RT, such that changes in voltage drop across RT due to ambient temperature variations are always exactly equal and opposite to the corresponding changes in thermocouple output.

REFERENCE VOLTAGE SOURCE

The reference voltage source (reference board) provides a constant voltage to the measuring circuit. The reference voltage source consists of a bracket and terminal board assembly located on the side of the recorder assembly, and is shown schematically as the reference board in the typical recorder wiring diagram for the Type 520 recorder. (See Fig. 5) The source produces a known voltage with which the unknown input-voltage is compared. A temperature-compensated silicon diode (reverse biased to operate in the Zener region) provides a constant voltage for a wide range of diode currents, and is arranged in a bridge circuit to eliminate the effects of line-voltage variations. A trimming (SPAN) potentiometer adjusts the value of the reference voltage and serves as a calibration adjustment for the recorder. The range plug is also located on the reference board to facilitate range changing.

THERMOCOUPLE-BREAK FEATURE

The amplifier circuit incorporated in temperature recorders have a thermocouple-break feature which will cause the pen pointer to be driven off-scale (either up scale or down scale) in the event that an open circuit occurs in the input signal circuit. A leaf-type jumper is provided on the reference board for selecting either up scale pen-pointer movement, down scale pen-pointer movement, or elimination of the thermocouple-break feature. This circuit applies a d-c bias to the input of the recorder which is overcome, during normal recorder operation, by the input signal. However, if the external circuit (input source) should open, this bias will now predominate and drive the pen pointer off scale. The bias introduced by this circuit produces a maximum error of ±0.2 percent that can be compensated by recalibration.

MAINTENANCE

In addition to the maintenance procedures recommended in the recorder General Information publication, the following calibration-checking procedure is recommended when a calibration check of the recorder is desired.

CALIBRATION CHECK

Equipment Required

In addition to common hand tools (screwdrivers, wrenches, etc.), the following equipment is needed to check the calibration of millivolt or temperature recorders. Note: Also refer to Calibration Circuits which follows this section for choice of test circuits for thermocouple and millivolt recorders.

1-Precision Potentiometer, Type K-2, Leeds and Northrup Co., or equivalent.

1-Test-millivolt source similar to the one shown schematically in Fig. 2.

1-Six-foot length of the appropriate thermocouple material for each terminal.*

1-Container of melting crushed ice.*

1-Table of thermocouple characteristics (temperature vs. millivolts).*

1-Calibrated glass thermometer.*

* Needed to check temperature recorders only.

Procedure

The following procedure is recommended to check the calibration of the recorder measuring circuit. This procedure is similar in most respects for both the millivolt and the thermocouple type instruments; the differences in the calibration procedure required for each type of instrument are described. Refer to the rating plate inside the recorder case for input-signal range.

1. Place the recorder power switch in the OFF position.

2. Manually rotate the servomotor shaft so that the pointer assembly moves to the right-hand scale end. The position of the pointer on the scale should coincide with the position of the pen on the chart. If the positions do not agree, loosen the four screws holding the scale plate and slide the scale plate to the correct position. Check positions again after tightening the screws.

3. Measure the overtravel (distance that the pointer will move beyond scale end before hitting the mechanical stop) at both ends. Overtravel should be the same at both ends (about 1/16 inch) and should be made equal by repositioning the mechanical stop on the servomotor shaft end in the measuring-slidewire assembly. Make sure that overtravel is not excessive at full-scale end so that pen will not hit timing-drum sprocket.

Note: The recorder may be calibrated by attaching an accurate millivolt source to the appropriate terminals on the terminal board at the rear of the case; or, if the terminal board is not readily accessible, to the test terminals on the reference board.

4. Check sensitivity of the recorder, as described under Amplifier Gain Adjustment, in the OPERATION section of the General Information publication.

5. Calibration Connections for Millivolt Recorder

   a. If the calibration is to be checked at the terminal board at the rear of the case:

      1) Disconnect the input-signal leads from the terminal board.

      2) Connect a d-c millivolt source similar to that shown in Fig. 2 to the recorder input terminals. (Sources for this purpose are available from several manufacturers.)

      3) Connect to the same terminals a precision potentiometer for accurately measuring the millivolt input.

   b. If the calibration is checked at the reference board:

      1) Disconnect the lead from the (+) terminal on the reference board.

      2) Connect the d-c millivolt source to the (-) and (+) terminals on the reference board.

      3) Connect to these terminals a precision potentiometer for accurately measuring the millivolt input. The input-signal leads do not need to be disconnected from the terminal board on the rear of the recorder case.

6. Calibration Connections for Thermocouple Recorder

a. If the calibration is checked at the terminal board at the rear of the case:

1) Disconnect the thermocouple leads at the cold-junction compensator.

2) Assemble a test circuit similar to one of those shown in Fig. 3, and connect the test circuit to the input terminals on the cold-junction compensator.

3) Use a calibrated thermometer to measure the temperature of the thermocouple-junction compensator on the terminal board at the rear of the case.

4) Convert this temperature reading (MV_2; see equation below) to millivolts by means of the appropriate thermocouple table (millivolt vs temperature). Subtract this millivolt value (MV_2) from the millivolt value corresponding to the recorder scale point being checked (MV_1). The resultant millivolt value, when applied to the recorder, should produce a recorder indication at the desired calibration point (MV):

$$MV = MV_1 - MV_2$$

Where:

MV = Millivolts for recorder calibration point.

MV_1 = Millivolts for recorder scale point being checked from thermocouple tables.

MV_2 = Millivolts for thermocouple junction-compensator temperature from thermocouple tables.

Note: This calculation applies only when using the test circuit illustrated in Fig. 3B. When using the test circuit illustrated in Fig. 3A, the value of MV_1 is used directly. For explanation of these requirements, see Test Circuits for Calibrating Thermocouple Recorders at the end of this publication.

b. If the calibration is to be checked at the reference board, perform Step 5,b, above, using the calibrating millivolts as determined per Steps 6,b,3, and 6,b,4, above.

7. Place the recorder power switch in the ON position and adjust the millivolt source to place the pointer exactly on the left-hand scale-end mark and then on the right-hand scale-end mark. If the millivolts required for these two pointer positions differ from those found on the rating plate (under the chart carriage) by less than one-half of one percent of full-scale span, the recorder is properly calibrated. If the required millivolts differ by more than one-half of one percent, but less than two percent of full-scale span, proceed to Steps 8 and 9. If the millivolts required differ by more than two percent of full-scale span, check for excessive electrical interference or a defective reference voltage source, as specified in the TROUBLE SHOOTING section of the General Information publication. If the corrective steps and checks described above do not reduce or eliminate the one percent

or greater difference, reposition the pen-pointer assembly to reduce the error to less than one percent. Then proceed to Steps 8 and 9.

8. Make the following adjustments to set the left-hand scale end correctly:

   a. Apply a millivolt input signal corresponding to left-hand scale end (from rating plate).

   b. Loosen the three screws holding the measuring-slidewire housing to the assembly frame.

   c. Rotate the housing until the pointer aligns with the left-hand scale-end mark.

   d. Recheck pointer position after tightening the housing screws.

9. Make the following adjustments to set the scale span correctly:

   a. Apply a millivolt input corresponding to the right-hand scale-end mark (from rating plate).

   b. Adjust the span potentiometer on the reference board to set the pen pointer exactly on the right-hand scale-end mark.

   c. Recheck the left-hand scale end again after completing the span adjustment.

   d. Repeat Steps 8 and 9, if necessary.

10. Place the recorder power switch in the OFF position; remove calibration circuits; reconnect input-signal leads; and place the recorder power switch in the ON position to place the recorder in operation again.

CALIBRATION CIRCUITS

When checking the calibration, or making amplifier adjustments, only simple test equipment need be used. The test equipment suggested (except for the precision potentiometer) is inexpensive, and the circuits, which are simple to construct, will provide an adequate means of simulating changes in the input test-signal level.

Suggested Millivolt Source for Checking Recorders

Fig. 2 is a schematic diagram of a simple millivolt source for the potentiometric measuring circuit. It is a potential-dividing circuit whose output can be adjusted for up to 50 millivolts by adjusting the COARSE and FINE potentiometers.

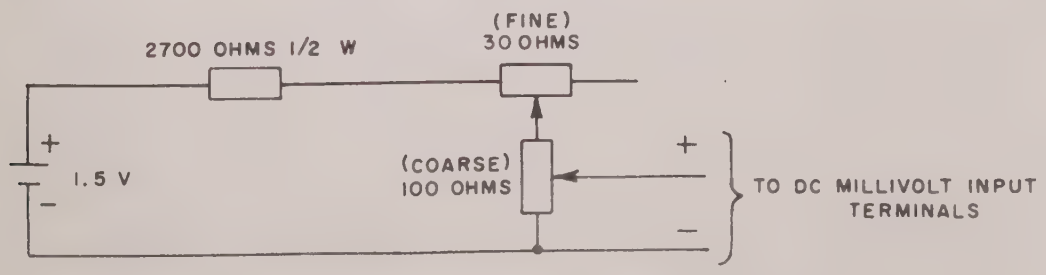


Fig. 2. Schematic diagram of a simple millivolt source

Test Circuits for Calibrating Thermocouple Recorders

A thermocouple recorder can be calibrated by using an artificial thermocouple. This avoids the necessity of heating the hot junction of the thermocouple to temperatures corresponding to the recorder range. Two test circuits which simulate thermocouples are shown in Fig. 3.

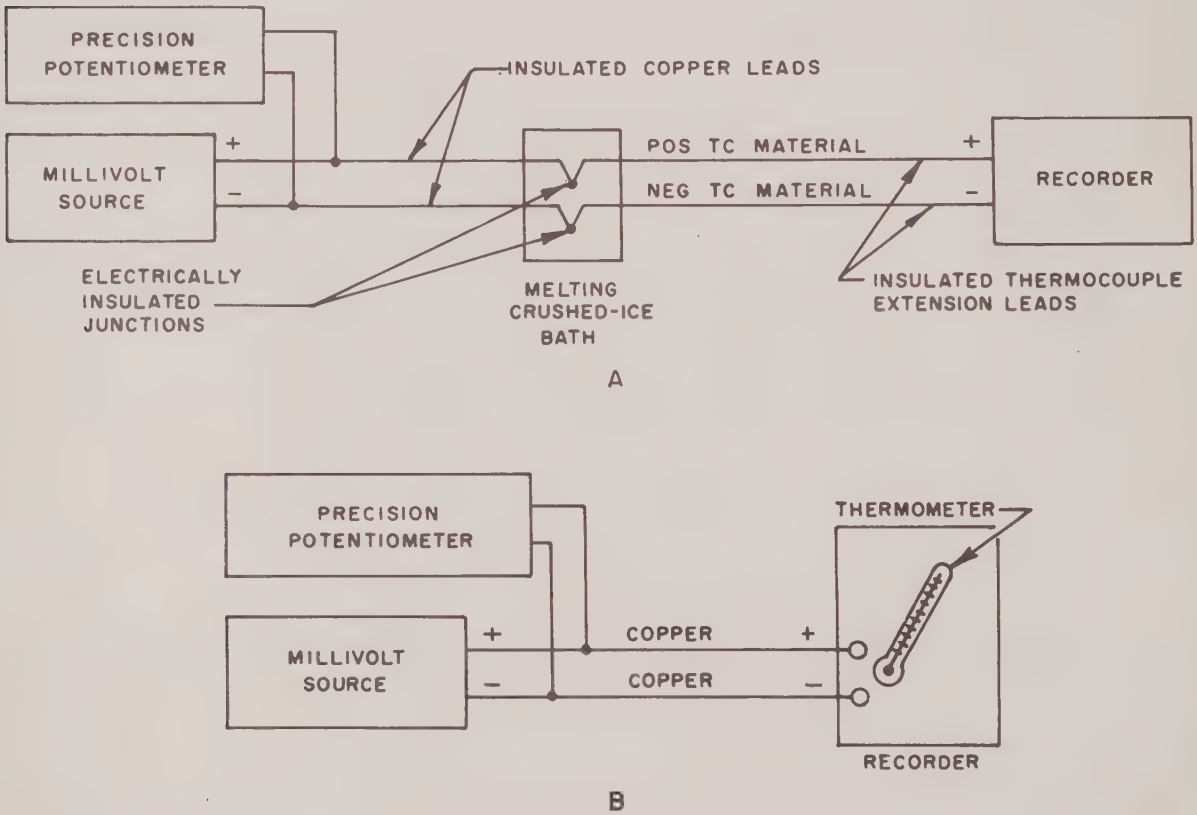


Fig. 3. Test circuits for thermocouple recorders

In Fig. 3A the "hot", or measuring junction, is held at 32 F in the ice bath and millivolts from the millivolt source simulate the measuring junction at higher temperatures. The value in millivolts corresponding to a particular temperature can be found in the appropriate millivolt-vs-temperature table and can be used without compensation providing that the table is based on a reference junction temperature of 32 F (0 C). The copper and thermocouple material junctions should be immersed four inches in separate melting-ice baths. They can be immersed in the same bath if they are electrically insulated from each other with a suitable material, such as a paraffin wax coating over the junctions and the entire section of the immersed leads. The thermocouple material must be the same type as that specified on the rating plate of the recorder. The accuracy of the precision potentiometer used to measure the millivolt output of the millivolt source should be commensurate with the accuracy of the recorder being checked. Be sure that all connections are tight, that both junctions are immersed in the ice bath(s) and have stabilized at 32 F, before calibration is attempted.

An alternate method is shown in Fig. 3B. With this circuit, no attempt is made to hold a fixed hot-junction temperature. The calibrated thermometer is used to measure the temperature of the millivolt input signal terminals and the bulb of the thermometer should be placed as close as possible to these terminals. The temperature reading on the thermometer should be converted to millivolts using the appropriate thermocouple millivolt-vs-temperature table. If the calibration of the recorder appears to be in error, make the adjustments recommended in the CALIBRATION CHECK section.

TROUBLE SHOOTING

If the recorder operation becomes faulty, trouble-shoot as directed in the Trouble Shooting section of the recorder General Information publication. Fig. 4, 5, and 6, which follow, porvide external connections, internal-wiring diagram, and schematic-wiring diagram, respectively, of potentiometric recorders.

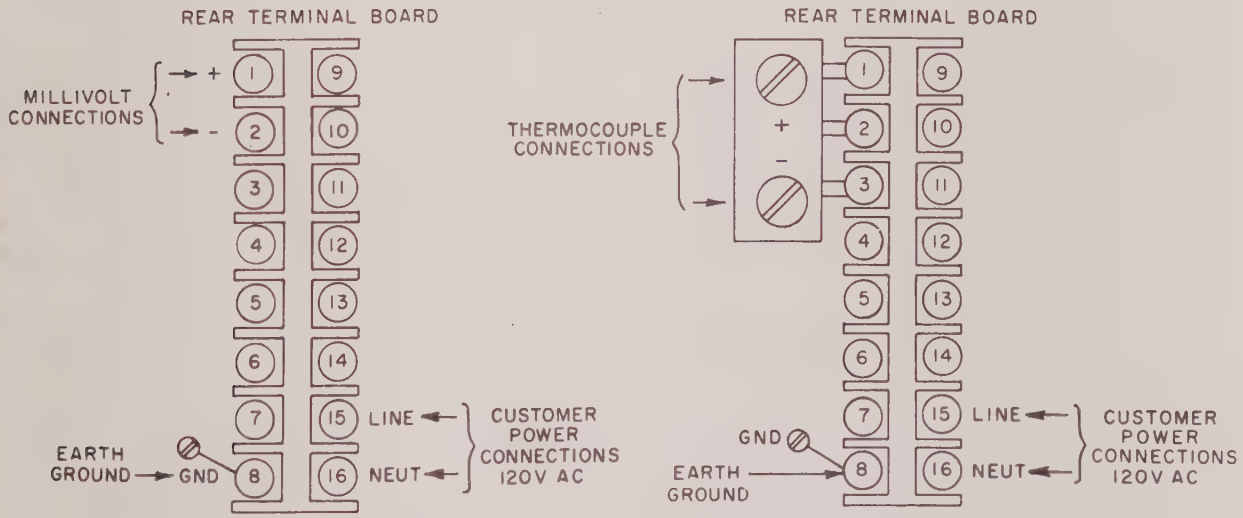


Fig. 4. External connection wiring diagrams, typical potentiometric recorders

NOTES

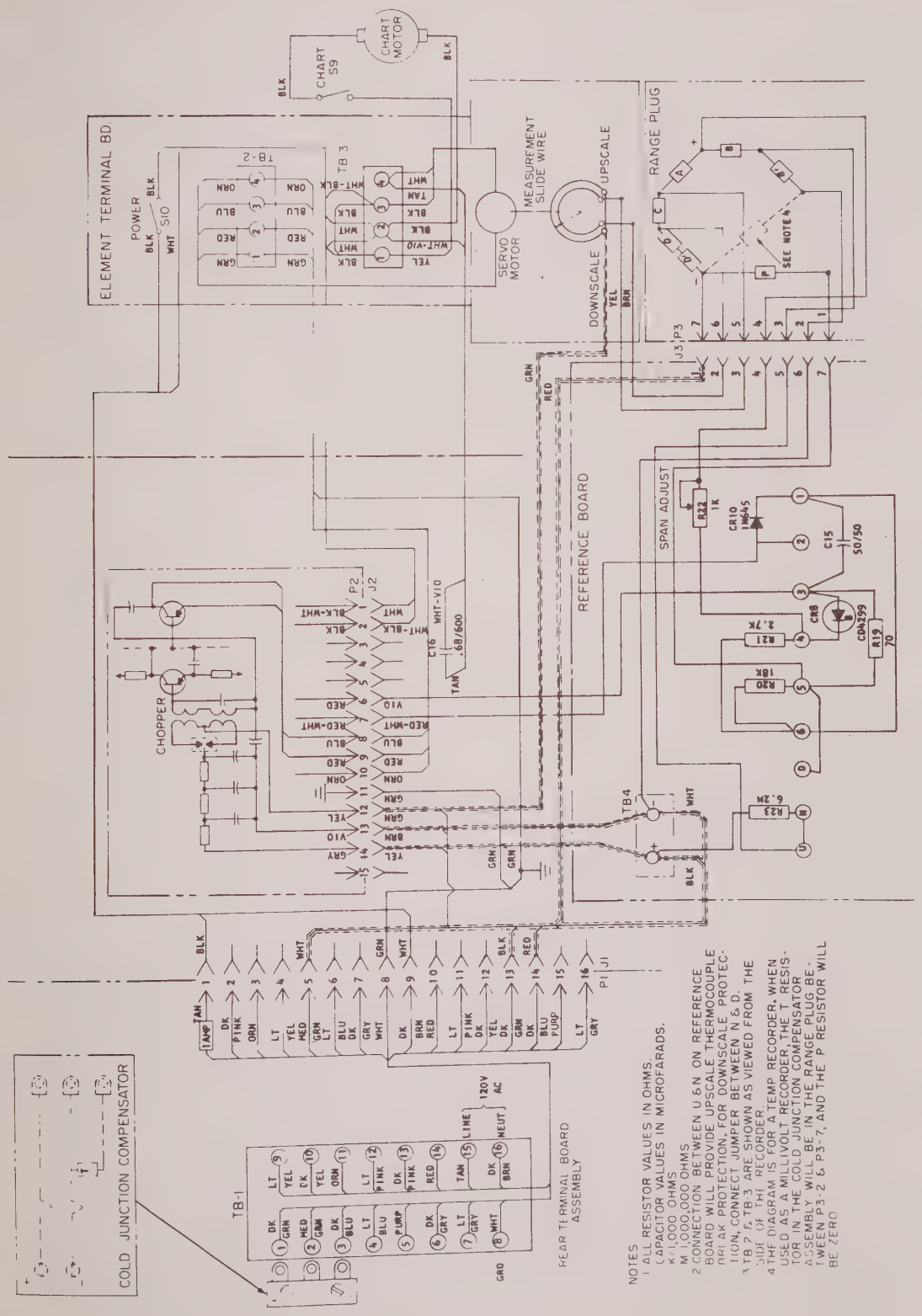
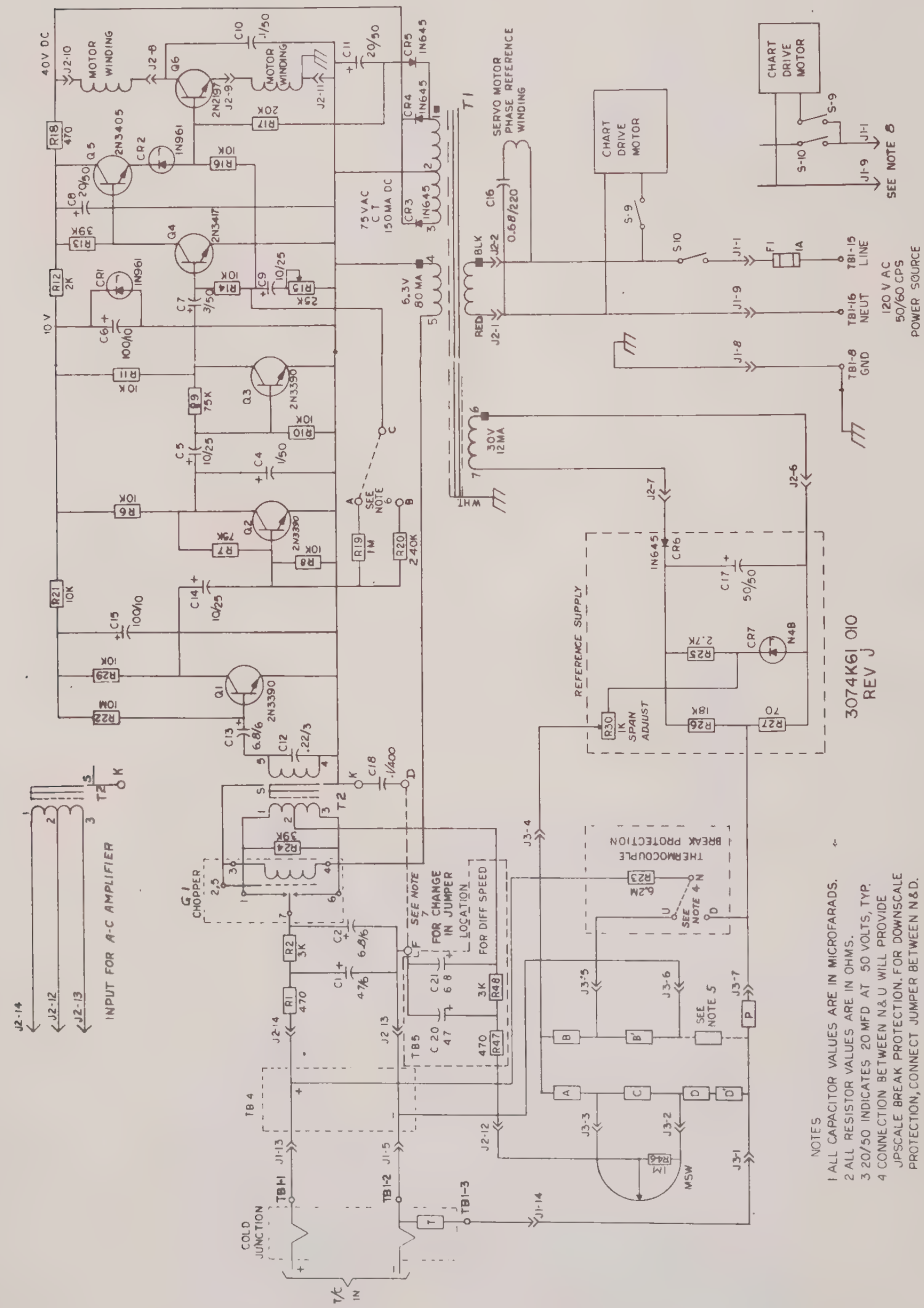


Fig. 5. Wiring diagram, potentiometric recorder



NOTES
1 ALL CAPACITOR VALUES ARE IN MICROFARADS.
2 ALL RESISTOR VALUES ARE IN OHMS.
3 20/50 INDICATES 20 MFD AT 50 VOLTS, TYP.
4 CONNECTION BETWEEN N & U WILL PROVIDE UPSCALE BREAK PROTECTION. FOR DOWNSCALE PROTECTION, CONNECT JUMPER BETWEEN N & D.
5 THE DIAGRAM IS FOR A TEMP RECORDER. WHEN USED AS A MILLIVOLT RECORDER, THE T RESISTOR IN THE COLD JUNCTION COMPENSATOR ASSEMBLY WILL BE IN THE RANGE PLUG BETWEEN J3-2 & J3-7 & THE P RESISTOR WILL BE ZERO.
6 CONNECT "A" TO "C" FOR HIGH GAIN (2.0-50 MV). CONNECT "B" TO "C" FOR LOW GAIN (5.0-100 MV)
7 JUMPER "D" TO "K" IF INPUT IS GROUNDED.
8 FOR 50 I 59 IS CONNECTED AS SHOWN. TO BLACK PEN & THE RED PEN. SCHEMATIC IS A DUPLICATE LESS CONNECTIONS TO S9 & THE CHART MOTOR.

Fig. 6. Schematic-wiring diagram. potentiometric recorder

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INSTRUCTIONS

ALARM OR CONTROL-INITATION WIRING DIAGRAMS

This publication contains the wiring diagrams for the various combinations of control-initiation, alarm, and signal transmission devices with which the Type 520 one-pen recorder or Type 521 two-pen recorder can be supplied. These combinations consist of snap-action switches (front-set or back-set), transmitting slidewires, and control slidewires. The wiring diagrams in this publication are of "standard" combinations of the devices; that is, combination of switches and/or slidewires which are common to many applications. Other combinations of switches and/or slidewires have separate wiring diagrams for the particular application included in the composite instructions shipped with the individual recorder.

All of the wiring diagrams for standard combinations are included in this publication. The recorder user can select the applicable wiring diagram for any recorder with a standard combination of devices by examining the recorder model number (printed on the recorder rating plate under the chart carriage) and selecting the correct drawing from the appropriate tables in the applicable recorder section below.

TYPE 520 SINGLE-PEN RECORDERS

Refer to the reference digits (underscored) of the following typical Type 520 recorder model number and Table I and II of this section to quickly identify the correct control-wiring diagram for the recorder.

TYPICAL TYPE 520 RECORDER MODEL NUMBER

50 520 11 2 A Z AA 1 AAA

Selection Procedures

If the first reference digit (2 in the above model number) is any number from "0" to "4", inclusive, use Table I to select the correct wiring diagram according to the second reference digit (A in the above model number).

If the first reference digit (2 in the above model number) is any number from "5" to "9", inclusive, use Table II to select the correct drawing according to the second reference digit (A in the above model number).

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TABLE I

(First Reference Digit "0" to "4", inclusive)

Second Reference Digit	Wiring Diagram No.
A	3080K61 001
B	" 002
C	" 003
D	" 004
E	" 005
K	" 006
L	" 007
M	" 008
N	" 009

TABLE II

First Reference Digit "5" to "9", inclusive)

Second Reference Digit	Wiring Diagram No.	Second Reference Digit	Wiring Diagram No.
A	3080K61 010	N	3080K61 020
B	" 011	P	" 021
C	" 012	R	" 022
D	" 013	S	" 023
E	" 014	T	" 024
F	" 015	U	" 025
G	" 016	W	" 026
H	" 017	X	" 027
J	" 018	Y	" 028
K	" 019		

TYPE 521 TWO-PEN RECORDERS

Refer to the reference digits of the following typical Type 521 recorder model number and Tables III, IV, and V to quickly identify the correct control-wiring diagram for the recorder.

TYPICAL TYPE 520 RECORDER MODEL NUMBER

50	521	10	3	A	B	AA	1	A	AA

Selection Procedures

The selection of the correct wiring diagrams for the two sections ('black' and 'red') of the Type 521 recorder is determined from three reference digits (underscored in the typical Type 521 recorder model number, above. The first two reference digits (3 and A in the above model number) and Tables III and IV are used to select the correct wiring diagram for the 'black' measuring-and-control section of the recorder. The third reference digit (B in the above model number) and Table V

are used to select the correct wiring diagram for the 'red' measuring-and-control section.

'Black-'Element Control Wiring Diagrams

If the first reference digit in the Type 521 model number (3 in the typical model number, above) is "0" to "4", inclusive, select the correct wiring diagram for the 'black' element in Table III by means of the second reference digit (A in the typical model number).

TABLE III

'BLACK' ELEMENT

(First Reference Digit "0" to "4", inclusive)

Second Reference Digit	Wiring Diagram No.
A	3080K61 001
B	" 002
C	" 003
D	" 004
E	" 005
K	" 006
L	" 007
M	" 008
N	" 009

If the first reference digit in the Type 521 model (3 in the typical model number, above) is any number from "5" to "9" inclusive, select the correct wiring diagram for the 'black' element in Table IV by means of the second reference digit (A in the model number, above).

TABLE IV

'BLACK' ELEMENT

(First Reference Digit "5" to "9", inclusive)

Second Reference Digit	Wiring Diagram No.	Second Reference Digit	Wiring Diagram No.
A	3080K61 010	N	3080K61 020
B	" 011	P	" 021
C	" 012	R	" 022
D	" 013	S	" 023
E	" 014	T	" 024
F	" 015	U	" 025
G	" 016	W	" 026
H	" 017	X	" 027
J	" 018	Y	" 028
K	" 019		

'Red'-Element Control Wiring Diagrams

Refer to Table V to identify the correct wiring diagram for the 'red' element according to the third reference digit in the model number (B in the typical recorder model number, above).

TABLE V
'RED' ELEMENT

Third Reference Digit	Wiring Diagram No.
A	3080K61 029
B	" 030
C	" 031
D	" 032
E	" 033
K	" 034
L	" 035
M	" 036
N	" 037

DRAWING INDEX

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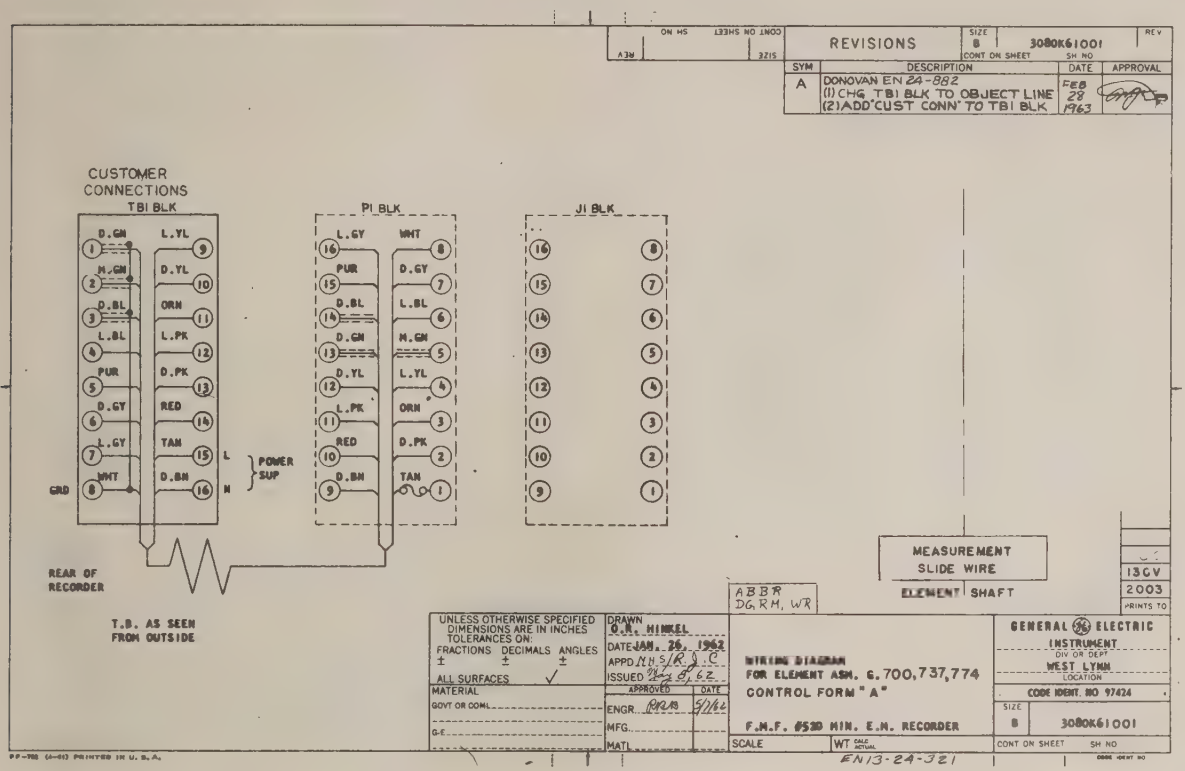
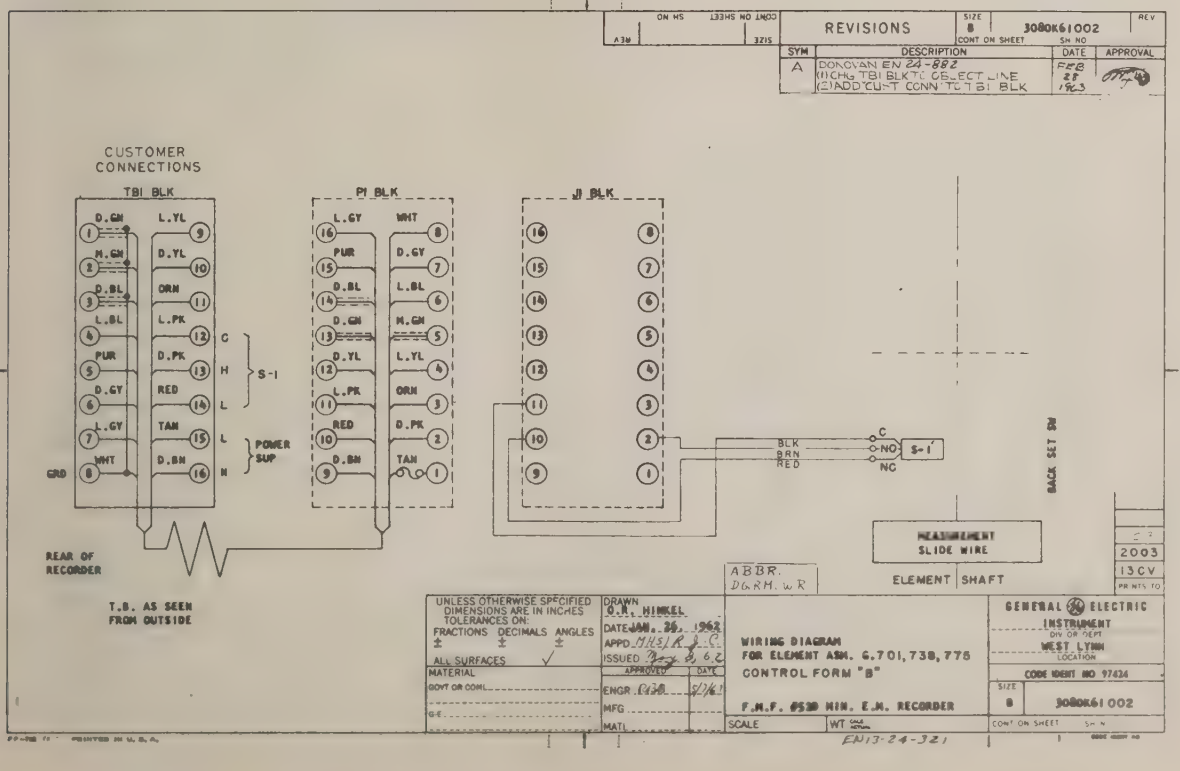
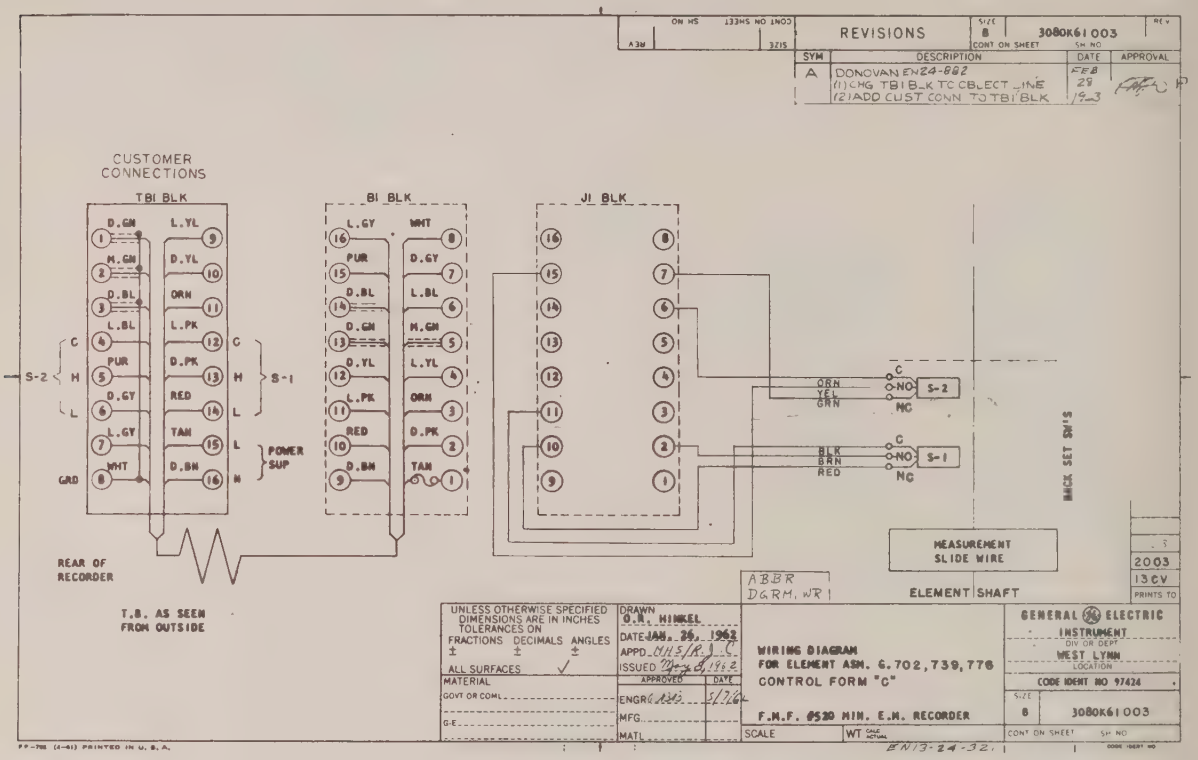
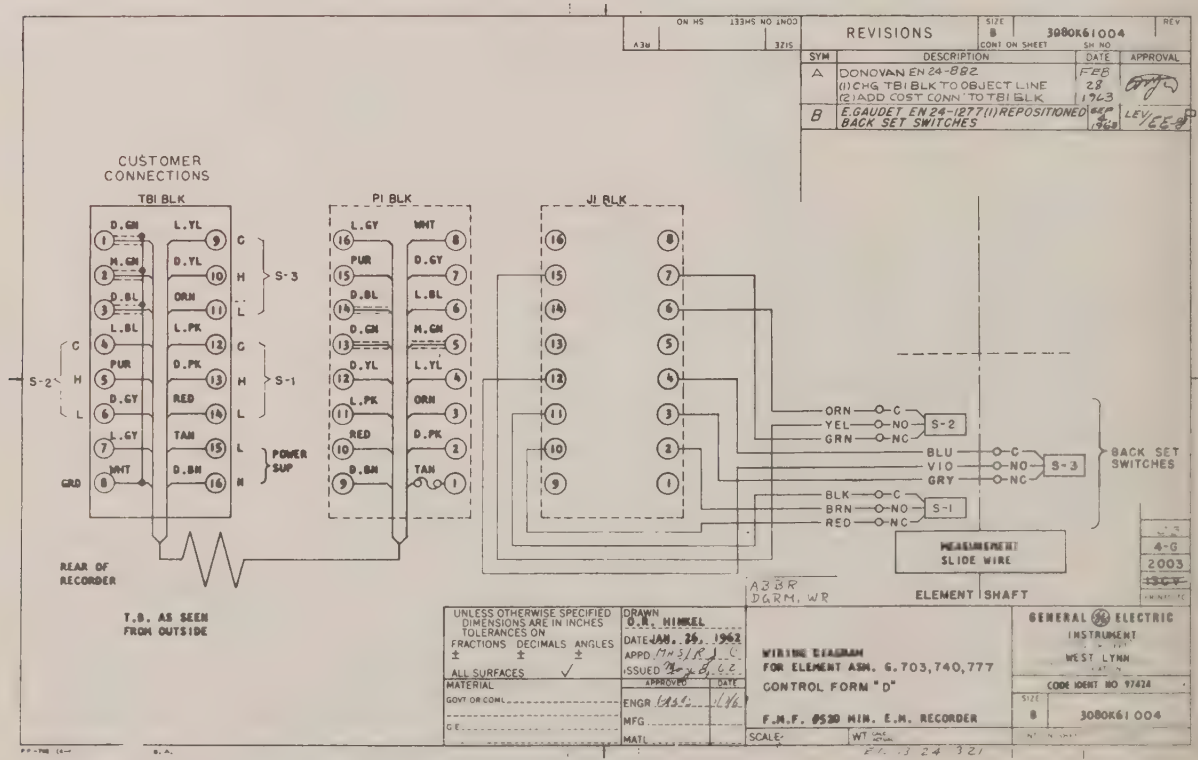
" 003	6	" 022	15
" 004	6	" 023	16
" 005	7	" 024	16
" 006	7	" 025	17
" 007	8	" 026	17
" 008	8	" 027	18
" 009	9	" 028	18
" 010	9	" 029	19
" 011	10	" 030	19
" 012	10	" 031	20
" 013	11	" 032	20
" 014	11	" 033	21
" 015	12	" 034	21
" 016	12	" 035	22
" 017	13	" 036	22
" 018	13	" 037	23
" 019	14		

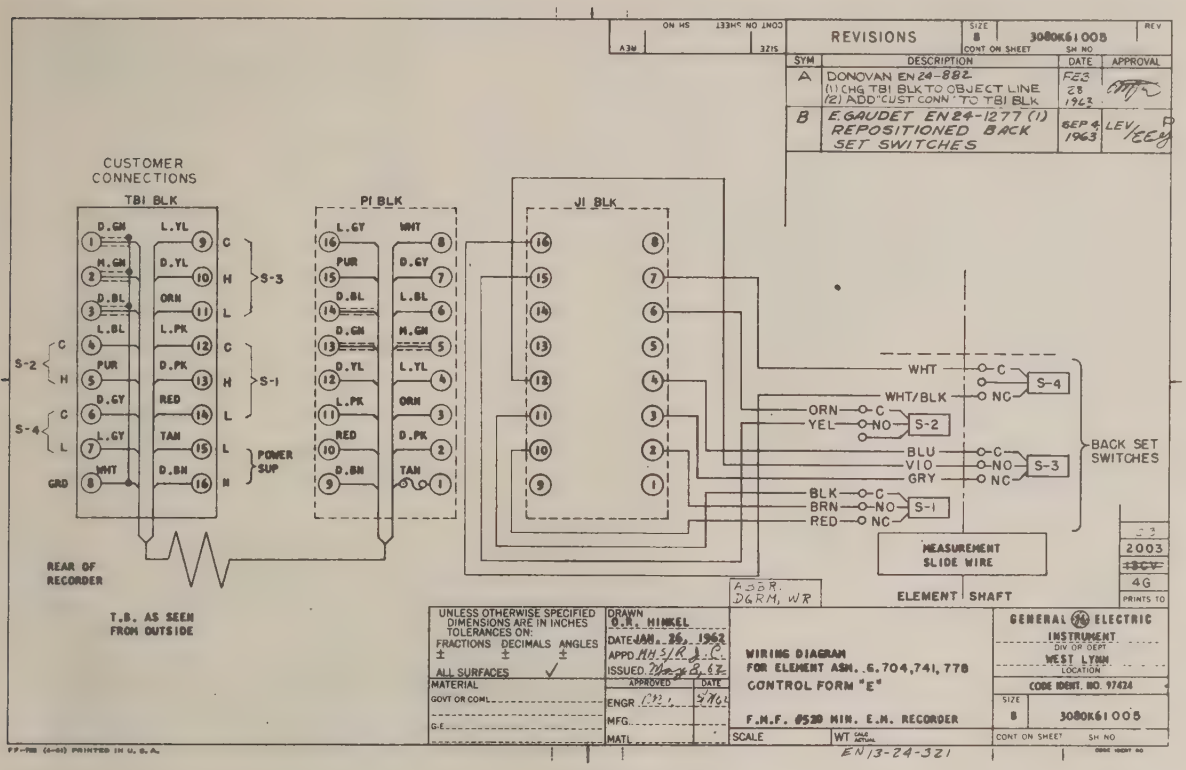

REVISIONS
SIZE B 3080K61001 REV
SYM A
DESCRIPTION: DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK
DATE: FEB 28 1963
APPROVAL
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN GRD
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
POWER SUP L N
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
ABBR DG, RM, WR
13CV
2003
PRINTS TO
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: FRACTIONS ± DECIMALS ± ANGLES ±
ALL SURFACES ✓
MATERIAL
GOVT OR COML
G-E
DRAWN O.H. HINKEL
DATE JAN. 26, 1962
APPD M.H.S/R.J.C.
ISSUED 2-8-62
APPROVED DATE
ENGR R.R.R. 5/16/62
MFG.
MATL
WIRING DIAGRAM FOR ELEMENT ASM. G.700,737,774
CONTROL FORM "A"
F.M.F. 6530 MIN. E.M. RECORDER
SCALE
WT CALC ACTUAL
GENERAL ELECTRIC
INSTRUMENT
DIV OR DEPT
WEST LYNN
LOCATION
CODE IDENT NO 97424
SIZE B 3080K61001
CONT ON SHEET
SH NO
EN13-24-321

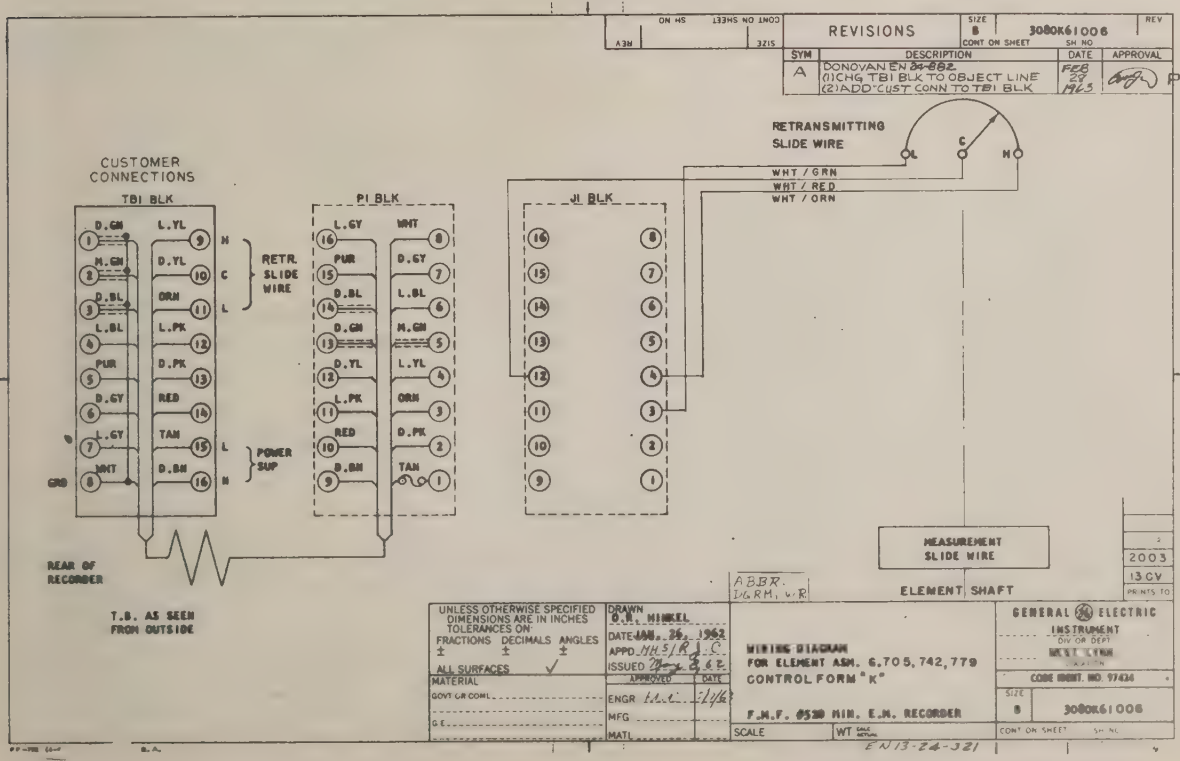

REVISIONS
SIZE B 3080K61002 REV
SYM A
DESCRIPTION: DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK
DATE: FEB 28 1963
APPROVAL
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN GRD
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
C H L S-1
POWER SUP L N
BLK BRN RED C NO NC S-1
BACK SET SW
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
ABBR DG, RM, WR
13CV
2003
PRINTS TO
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: FRACTIONS ± DECIMALS ± ANGLES ±
ALL SURFACES ✓
MATERIAL
GOVT OR COML
G-E
DRAWN O.H. HINKEL
DATE JAN. 26, 1962
APPD M.H.S/R.J.C.
ISSUED 2-8-62
APPROVED DATE
ENGR R.R.R. 5/16/62
MFG.
MATL
WIRING DIAGRAM FOR ELEMENT ASM. G.701,738,776
CONTROL FORM "B"
F.M.F. 6530 MIN. E.M. RECORDER
SCALE
WT CALC ACTUAL
GENERAL ELECTRIC
INSTRUMENT
DIV OR DEPT
WEST LYNN
LOCATION
CODE IDENT NO 97424
SIZE B 3080K61002
CONT ON SHEET
SH NO
EN13-24-321

Alarm or Control-initiation Wiring Diagrams

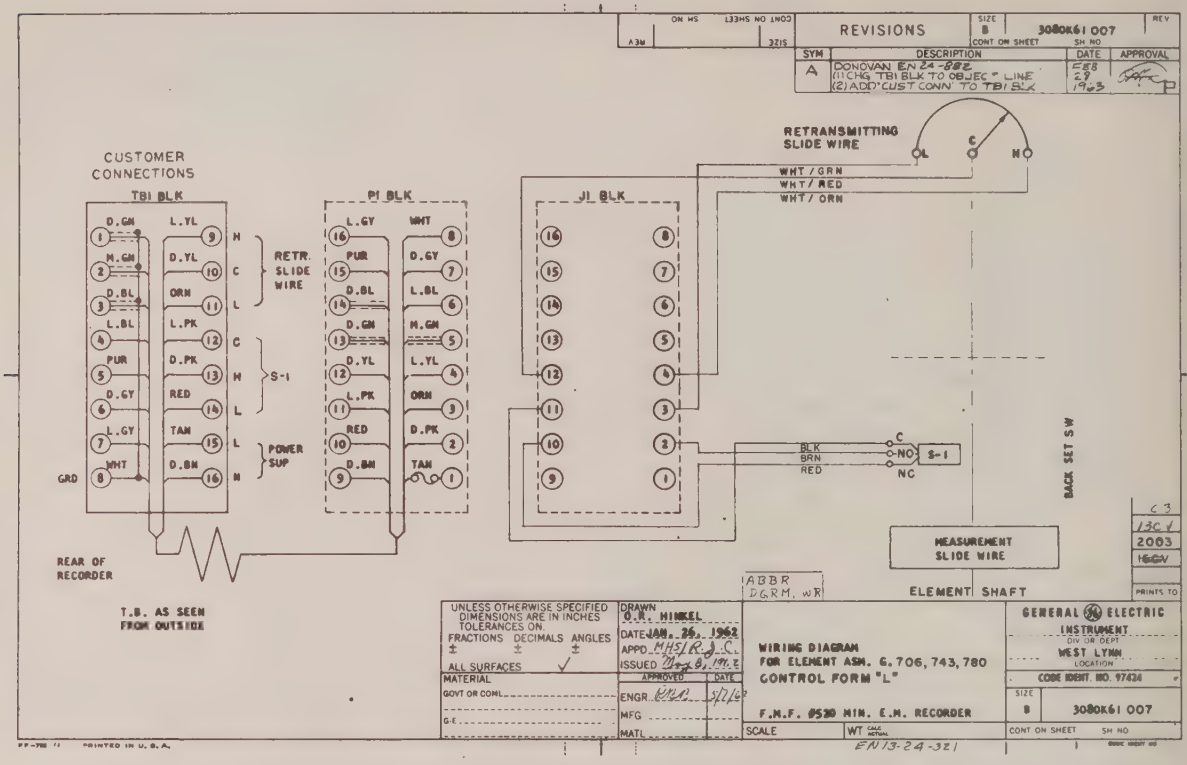

REVISIONS
SIZE B 3080K61003
SYM A
DESCRIPTION: DONOVAN EN24-882 (1) CHG TB1 BLK TO OBJECT LINE (2) ADD CUST CONN TO TB1 BLK
DATE: FEB 29 1963
APPROVAL
CUSTOMER CONNECTIONS
TB1 BLK
P1 BLK
J1 BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
S-2 C H L
S-1 C H L
POWER SUP L N
GRD
ORN YEL GRN C NO NC S-2
BLK BRN RED C NO NC S-1
BACK SET SW'S
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ABBR DGRM. WR
ELEMENT SHAFT
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓ MATERIAL
DRAWN O.R. HINKEL
DATE JAN. 24, 1962
APPD M.H.S/R.J.C.
ISSUED May 8, 1962
APPROVED DATE
GOVT OR COML ENGR
G-E MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.702,739,776 CONTROL FORM "C"
F.M.F. 8520 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT NO 97424
SIZE B 3080K61003
CONT ON SHEET SH NO
EN13-24-32
2003
13CV
PRINTS TO

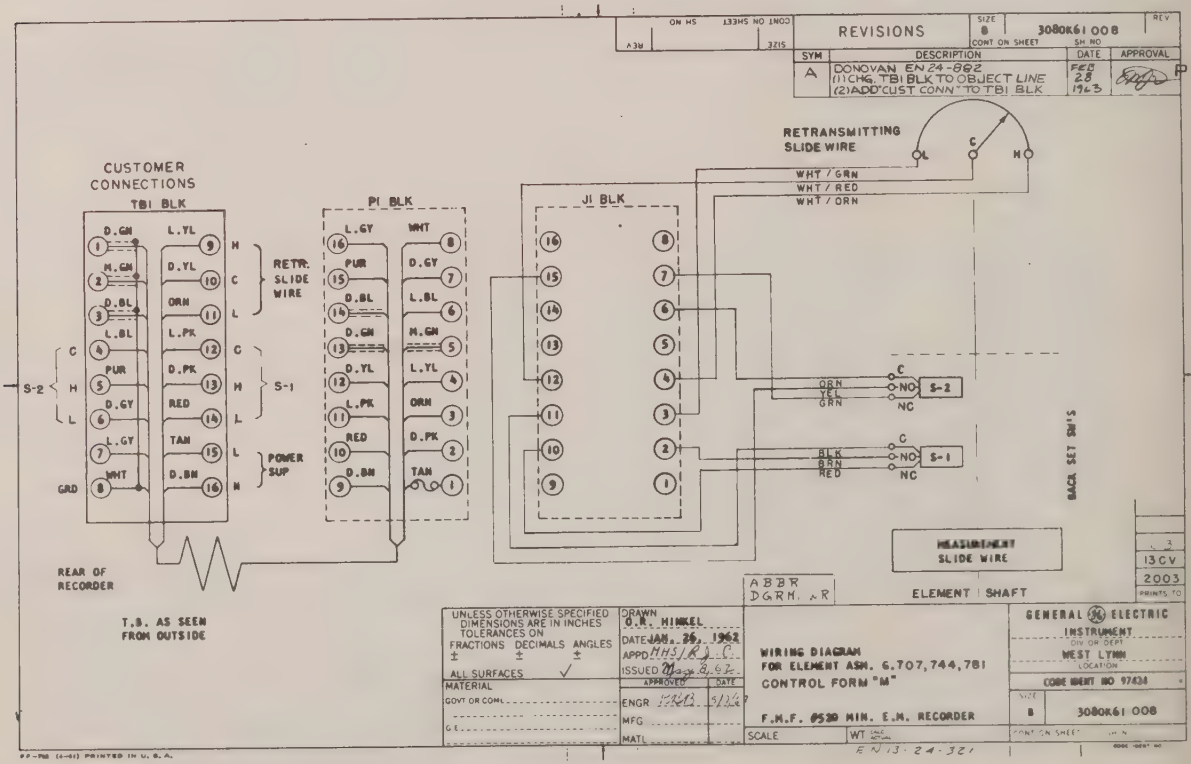

REVISIONS
SIZE B 3080K61004
SYM A
DESCRIPTION: DONOVAN EN 24-882 (1) CHG TB1 BLK TO OBJECT LINE (2) ADD COST CONN TO TB1 BLK
DATE: FEB 28 1963
APPROVAL
SYM B
DESCRIPTION: E.GAUDET EN 24-1277 (1) REPOSITIONED BACK SET SWITCHES
DATE: SEP 4 1963
LEV EE-B
CUSTOMER CONNECTIONS
TB1 BLK
P1 BLK
J1 BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
S-2 C H L
S-3 C H L
S-1 C H L
POWER SUP L N
GRD
ORN YEL GRN C NO NC S-2
BLU VIO GRY C NO NC S-3
BLK BRN RED C NO NC S-1
BACK SET SWITCHES
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ABBR DGRM. WR
ELEMENT SHAFT
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓ MATERIAL
DRAWN O.R. HINKEL
DATE JAN. 24, 1962
APPD M.H.S/R.J.C.
ISSUED May 8, 62
APPROVED DATE
GOVT OR COML ENGR
G-E MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.703,740,777 CONTROL FORM "D"
F.M.F. 8520 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT NO 97424
SIZE B 3080K61004
CONT ON SHEET SH NO
EN-13 24 32
4-G
2003
13CV

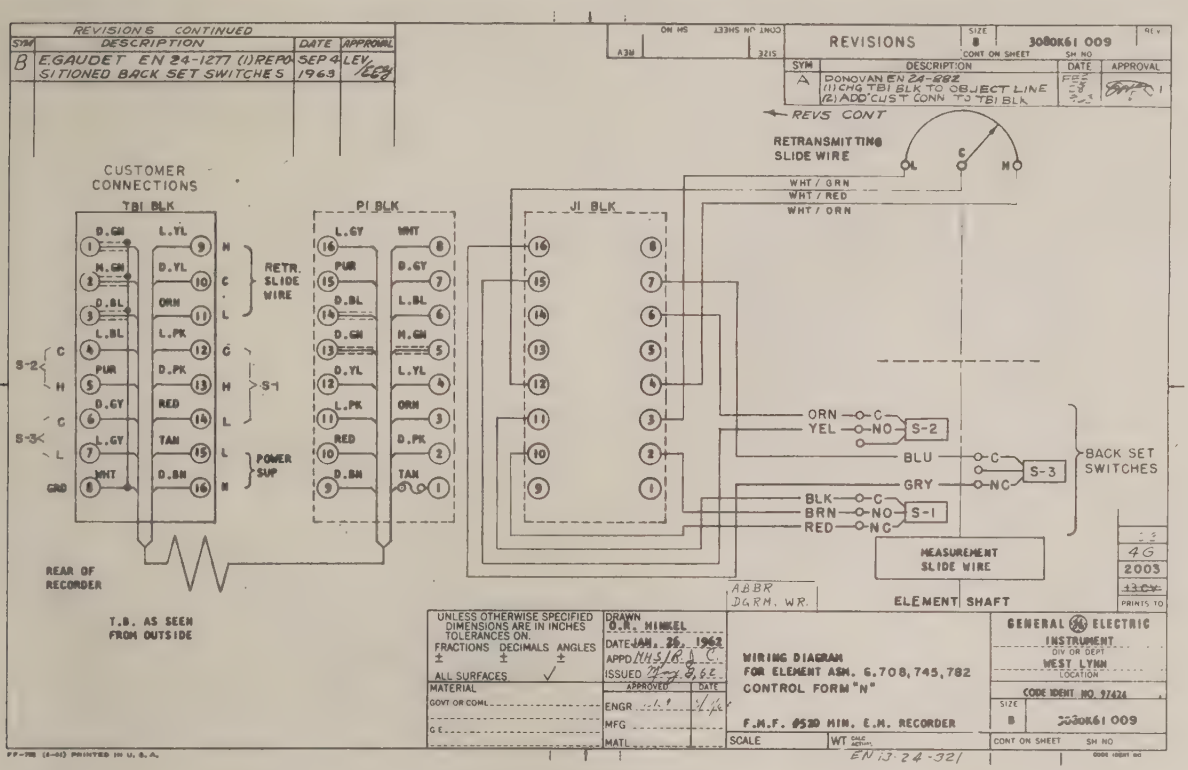

REVISIONS
SIZE B 3080K61005 REV
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD "CUST CONN" TO TBI BLK FEB 28 1963
B E. GAUDET EN 24-1277 (1) REPOSITIONED BACK SET SWITCHES SEP 4 1963 LEV/EEB
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
S-1 S-2 S-3 S-4
C H L N GRD POWER SUP
WHT WHT/BLK ORN YEL BLU VIO GRY BLK BRN RED
C NC NO
BACK SET SWITCHES
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
A3BR. D6RM, WR
2003
13CV
4G
PRINTS TO
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: FRACTIONS ± DECIMALS ± ANGLES ± ALL SURFACES ✓
MATERIAL GOVT OR COML G-E
DRAWN O.R. HINKEL DATE JAN. 26, 1962 APPD MH S/R J.C. ISSUED May 8, 67
APPROVED DATE ENGR C.P. 5/16/67 MFG MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6,704,741,778 CONTROL FORM "E"
F.M.F. 0520 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97424
SIZE B 3080K61005
CONT ON SHEET SH NO
EN13-24-321

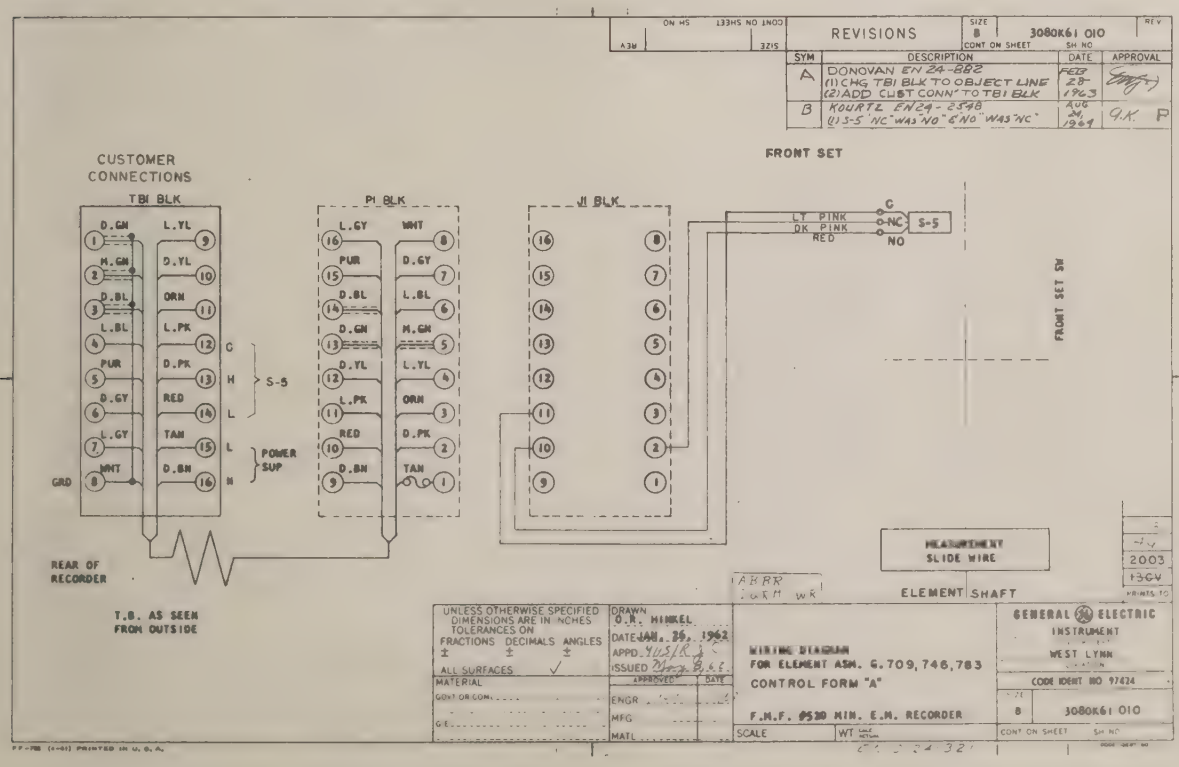

REVISIONS
SIZE B 3080K61006 REV
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD "CUST CONN" TO TBI BLK FEB 28 1963
RETRANSMITTING SLIDE WIRE
L C H
WHT / GRN
WHT / RED
WHT / ORN
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
RETR. SLIDE WIRE
POWER SUP
GRD
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
A3BR. D6RM, WR
2003
13CV
PRINTS TO
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: FRACTIONS ± DECIMALS ± ANGLES ± ALL SURFACES ✓
MATERIAL GOVT OR COML G-E
DRAWN O.R. HINKEL DATE JAN. 26, 1962 APPD MH S/R J.C. ISSUED May 8, 67
APPROVED DATE ENGR C.P. 5/16/67 MFG MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6,705,742,779 CONTROL FORM "K"
F.M.F. 0520 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97424
SIZE B 3080K61006
CONT ON SHEET SH NO
EN13-24-321

Alarm or Control-initiation Wiring Diagrams

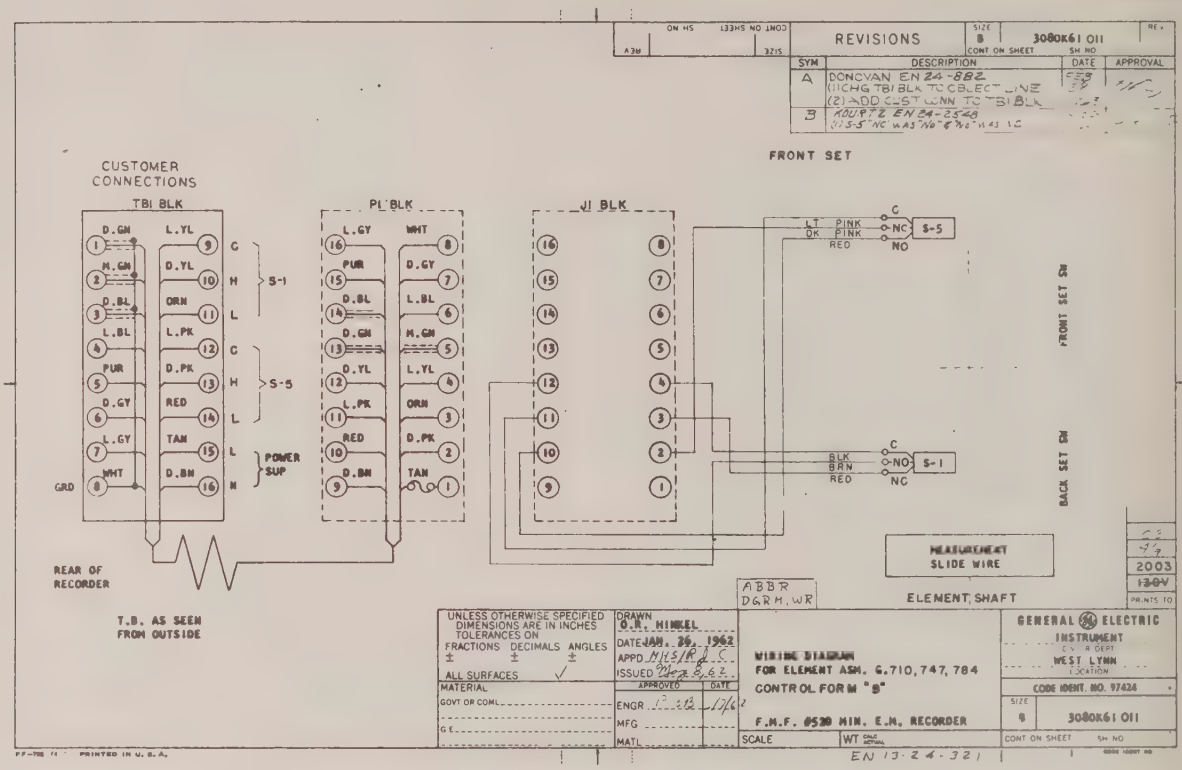


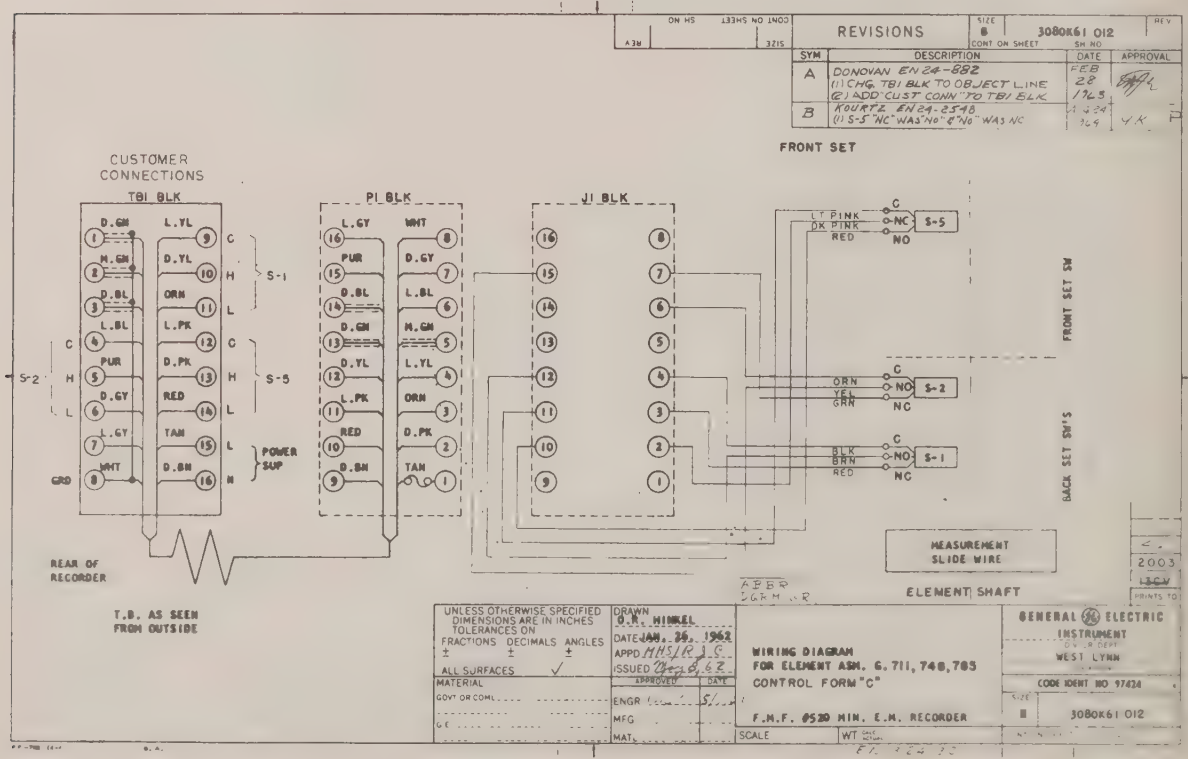


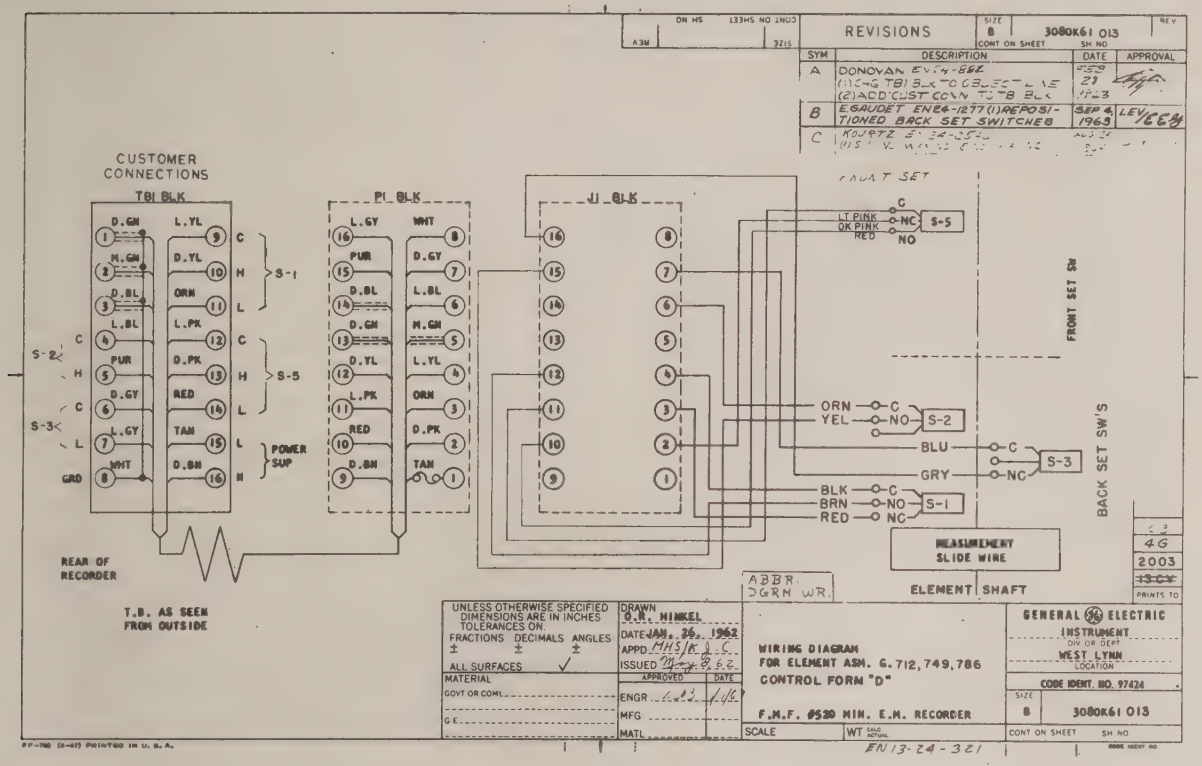

REVISIONS CONTINUED
B E.GAUDET EN 24-1277 (1) REPOSITIONED BACK SET SWITCHES SEP 4 1963
REVISIONS
A DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK FEB 28 1963
REVS CONT
RETRANSMITTING SLIDE WIRE
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
RETR. SLIDE WIRE
S-1
S-2
S-3
POWER SUP
WHT / GRN
WHT / RED
WHT / ORN
ORN C S-2 NO
YEL NO
BLU C S-3
GRY NC
BACK SET SWITCHES
BLK C S-1
BRN NO
RED NC
MEASUREMENT SLIDE WIRE
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
ELEMENT SHAFT
DRAWN O.R. MINKEL
DATE JAN. 25, 1962
WIRING DIAGRAM FOR ELEMENT ASM. 6.708, 745, 782 CONTROL FORM "N"
F.M.F. #520 MIN. E.M. RECORDER
GENERAL ELECTRIC INSTRUMENT
WEST LYNN
CODE IDENT NO. 97424
3080K61 009
EN 13-24-321

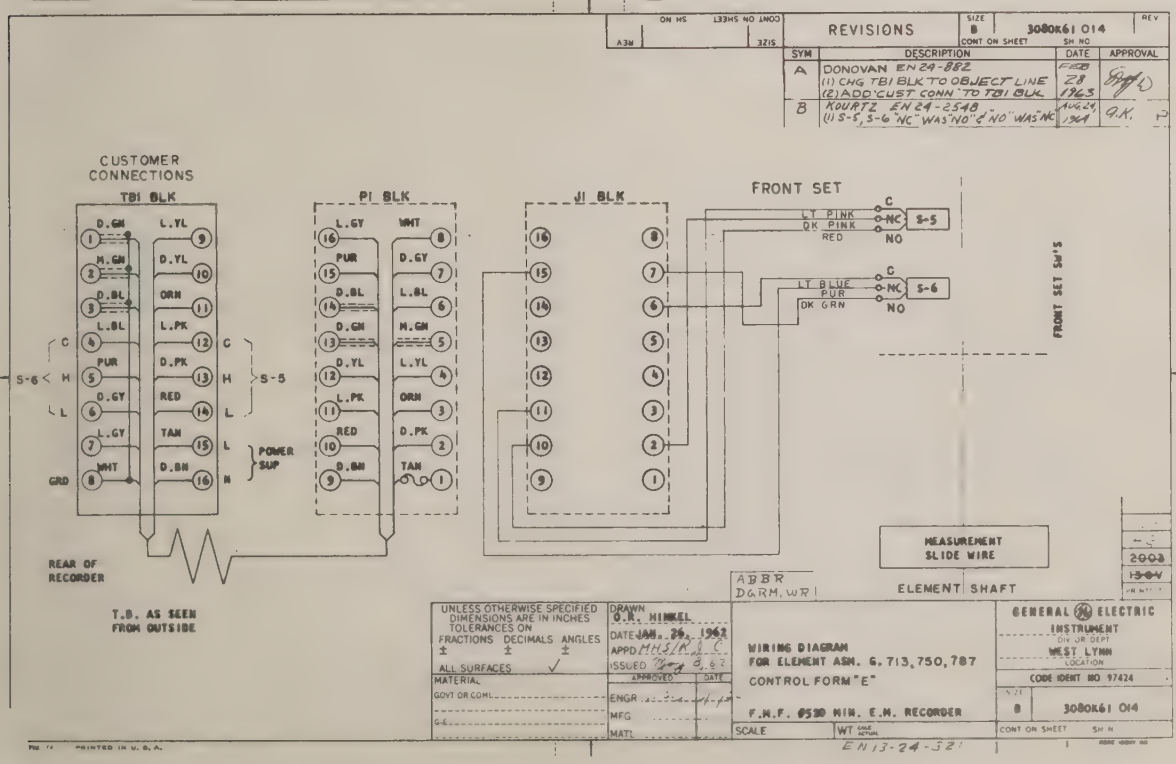

REVISIONS
A DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK FEB 28 1963
B KOURTZ EN24-2548 (1) S-5 NC WAS NO C NO WAS NC AUG 21 1964
FRONT SET
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
S-5
POWER SUP
LT PINK C NC S-5
DK PINK NO
RED
FRONT SET AS
MEASUREMENT SLIDE WIRE
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
ELEMENT SHAFT
DRAWN O.R. MINKEL
DATE JAN. 25, 1962
WIRING DIAGRAM FOR ELEMENT ASM. 6.709, 746, 783 CONTROL FORM "A"
F.M.F. #520 MIN. E.M. RECORDER
GENERAL ELECTRIC INSTRUMENT
WEST LYNN
CODE IDENT NO 97424
3080K61 010

Alarm or Control-initiation Wiring Diagrams

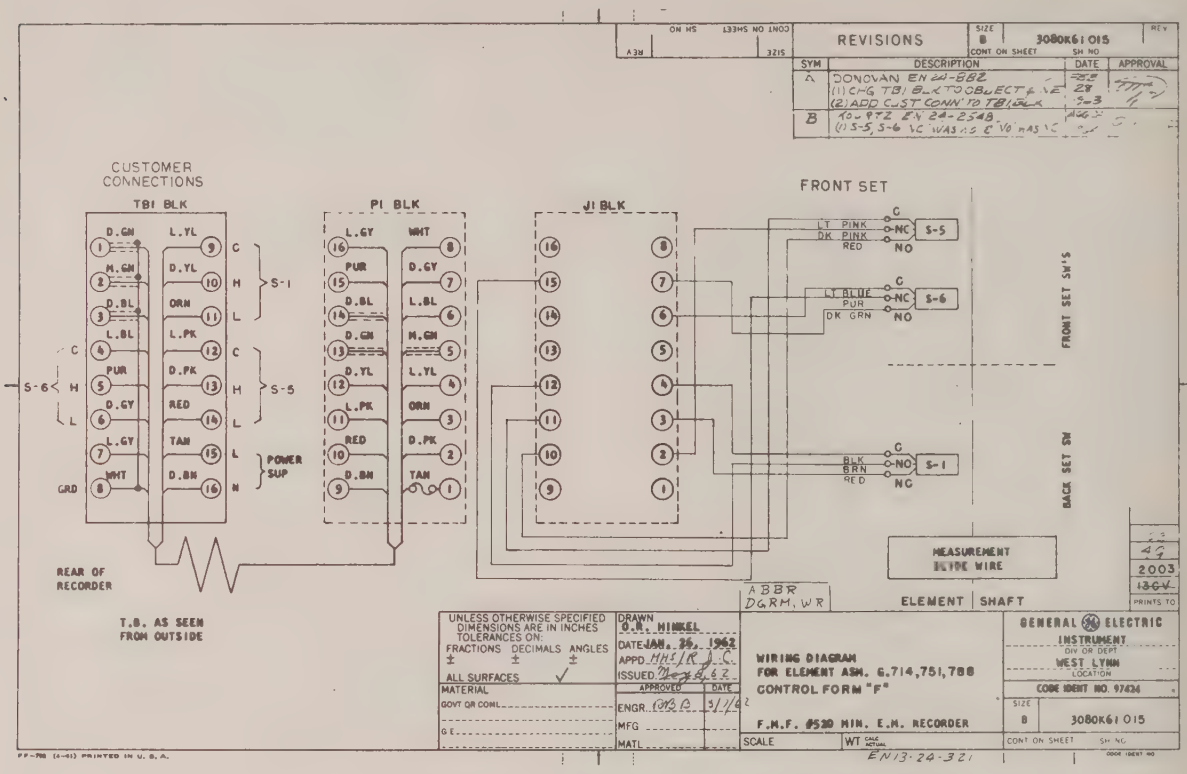

REVISIONS
SIZE B 3080K61 011
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK FEB 28 1963
B KOURTZ EN 24-254B (1) S-5 "NC" WAS "NO" & "NO" WAS NC
FRONT SET
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN GRD
S-1 S-5 POWER SUP
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
LT PINK DK PINK RED S-5 NC NO
BLK BRN RED S-1 NC NO
FRONT SET SW
BACK SET SW
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
ABBR D&RM. WR
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓
MATERIAL GOVT OR COML GE
DRAWN O.R. HINKEL DATE JAN. 26, 1962 APPD MHS/IR J.C. ISSUED 2-8-62
APPROVED DATE ENGR MFG MAT
WIRING DIAGRAM FOR ELEMENT ASM. 6,710,747,784 CONTROL FORM "B"
F.M.F. #530 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT CY. & DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97424
SIZE B 3080K61 011
CONT ON SHEET SH NO
EN 13-24-321

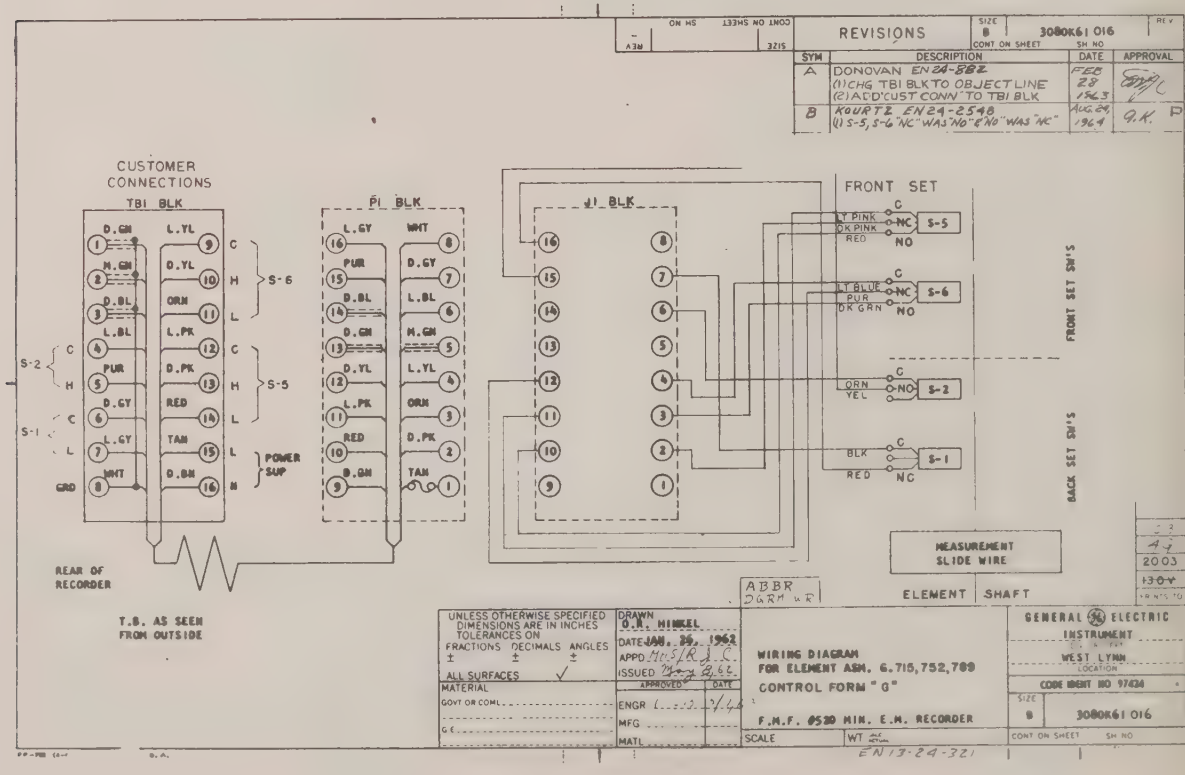

REVISIONS
SIZE B 3080K61 012
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK FEB 28 1963
B KOURTZ EN 24-254B (1) S-5 "NC" WAS "NO" & "NO" WAS NC
FRONT SET
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN GRD
S-2 S-1 S-5 POWER SUP
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
LT PINK DK PINK RED S-5 NC NO
ORN YEL GRN S-2 NC NO
BLK BRN RED S-1 NC NO
FRONT SET SW
BACK SET SW'S
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
ABBR D&RM. WR
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓
MATERIAL GOVT OR COML GE
DRAWN O.R. HINKEL DATE JAN. 26, 1962 APPD MHS/IR J.C. ISSUED 2-8-62
APPROVED DATE ENGR MFG MAT
WIRING DIAGRAM FOR ELEMENT ASM. 6,711,748,785 CONTROL FORM "C"
F.M.F. #530 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT CY. & DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97424
SIZE B 3080K61 012
CONT ON SHEET SH NO

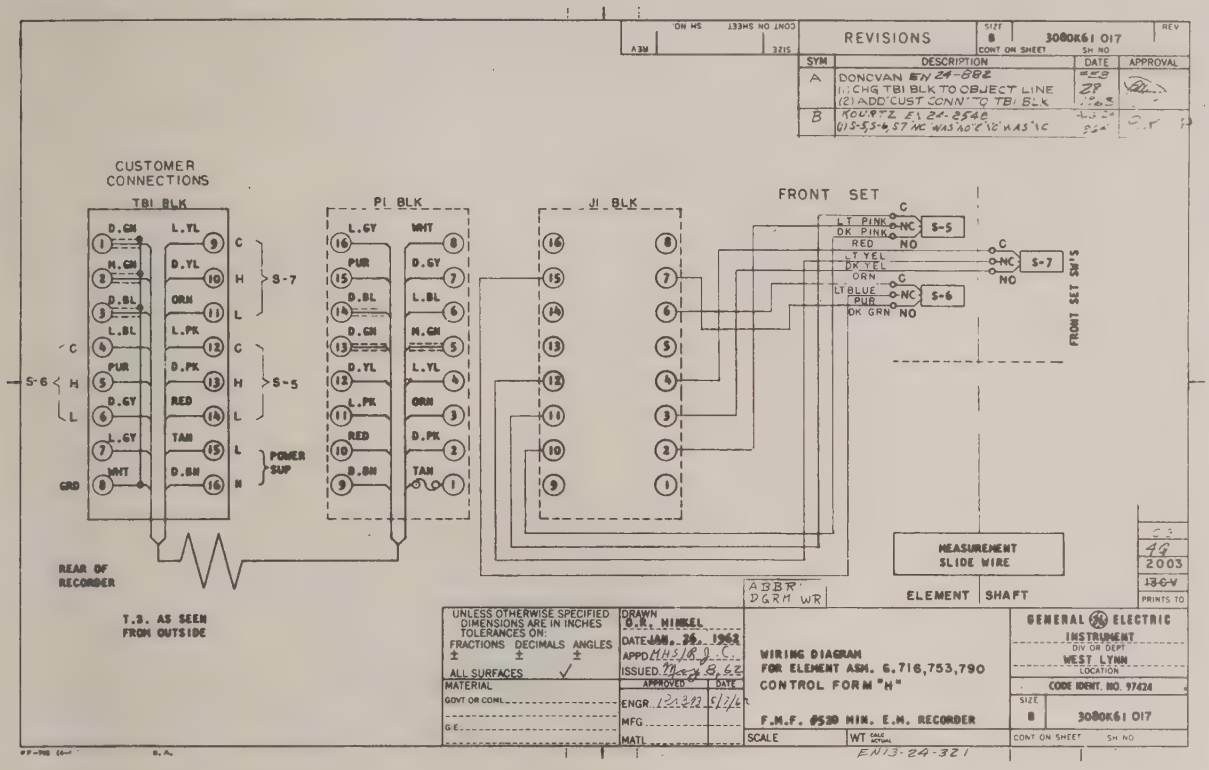

REVISIONS
SIZE B 3080K61 013 REV
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK 1963
B E.GAUDET EN24-1277 (1) REPOSITIONED BACK SET SWITCHES SEP 4, 1963 LEV
C KOURTZ EN 24-2548 (1) S-5, S-6 "NC" WAS "NO" & "NO" WAS "NC"
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
S-1 S-5 S-2 S-3 POWER SUP
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
FRONT SET
LT PINK DK PINK RED NO C NC S-5
FRONT SET SW
BACK SET SW'S
ORN YEL BLU GRY BLK BRN RED S-2 S-3 S-1
MEASUREMENT SLIDE WIRE
ABBR DGRM WR
ELEMENT SHAFT
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓ MATERIAL GOVT OR COML G-E
DRAWN O.R. HINKEL DATE JAN. 29, 1962 APPD MHS/R.J.C. ISSUED May 8, 62
APPROVED DATE ENGR MFG MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.712,749,786 CONTROL FORM "D"
F.M.F. #530 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97424
SIZE B 3080K61 013
CONT ON SHEET SH NO
EN13-24-321

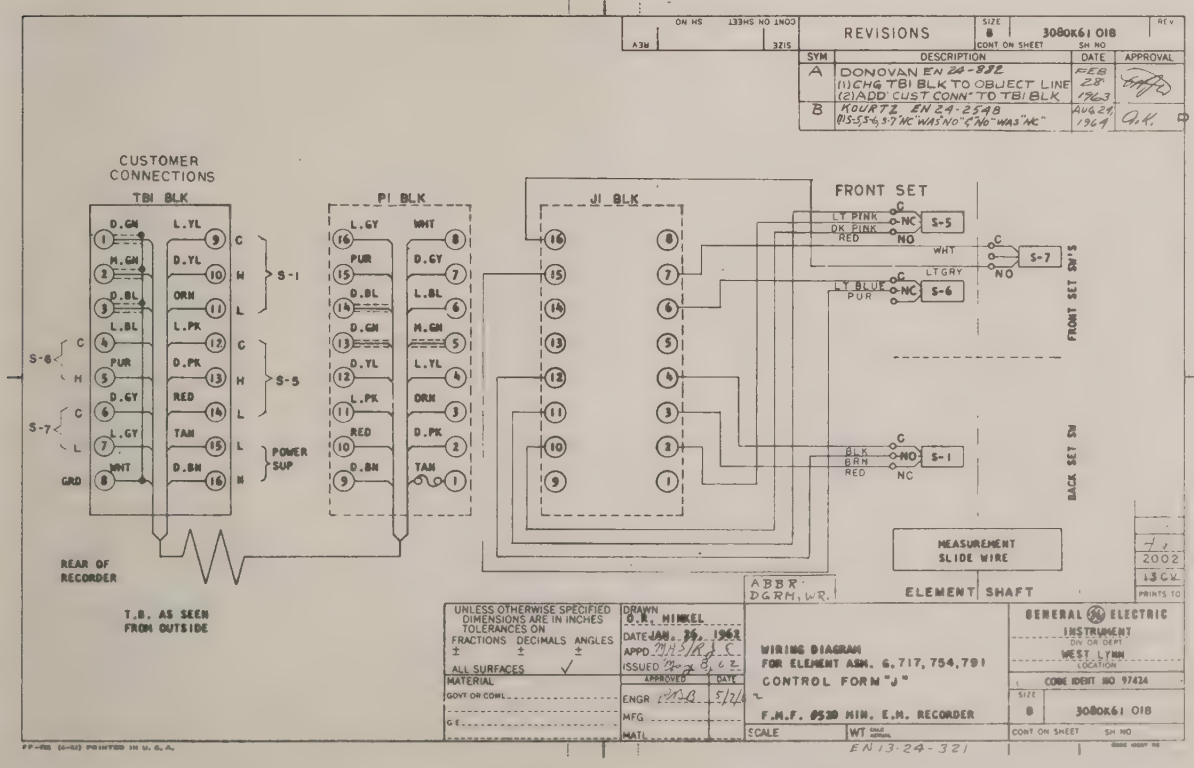

REVISIONS
SIZE B 3080K61 014 REV
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK FEB 28 1963
B KOURTZ EN 24-2548 (1) S-5, S-6 "NC" WAS "NO" & "NO" WAS "NC" AUG 24 1964 O.K.
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
S-5 S-6 POWER SUP
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
FRONT SET
LT PINK DK PINK RED NO C NC S-5
LT BLUE PUR DK GRN S-6
FRONT SET SW'S
MEASUREMENT SLIDE WIRE
ABBR DGRM WR
ELEMENT SHAFT
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓ MATERIAL GOVT OR COML G-E
DRAWN O.R. HINKEL DATE JAN. 29, 1962 APPD MHS/R.J.C. ISSUED May 8, 62
APPROVED DATE ENGR MFG MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.713,750,787 CONTROL FORM "E"
F.M.F. #530 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97424
SIZE B 3080K61 014
CONT ON SHEET SH NO
EN13-24-321

Alarm or Control-initiation Wiring Diagrams

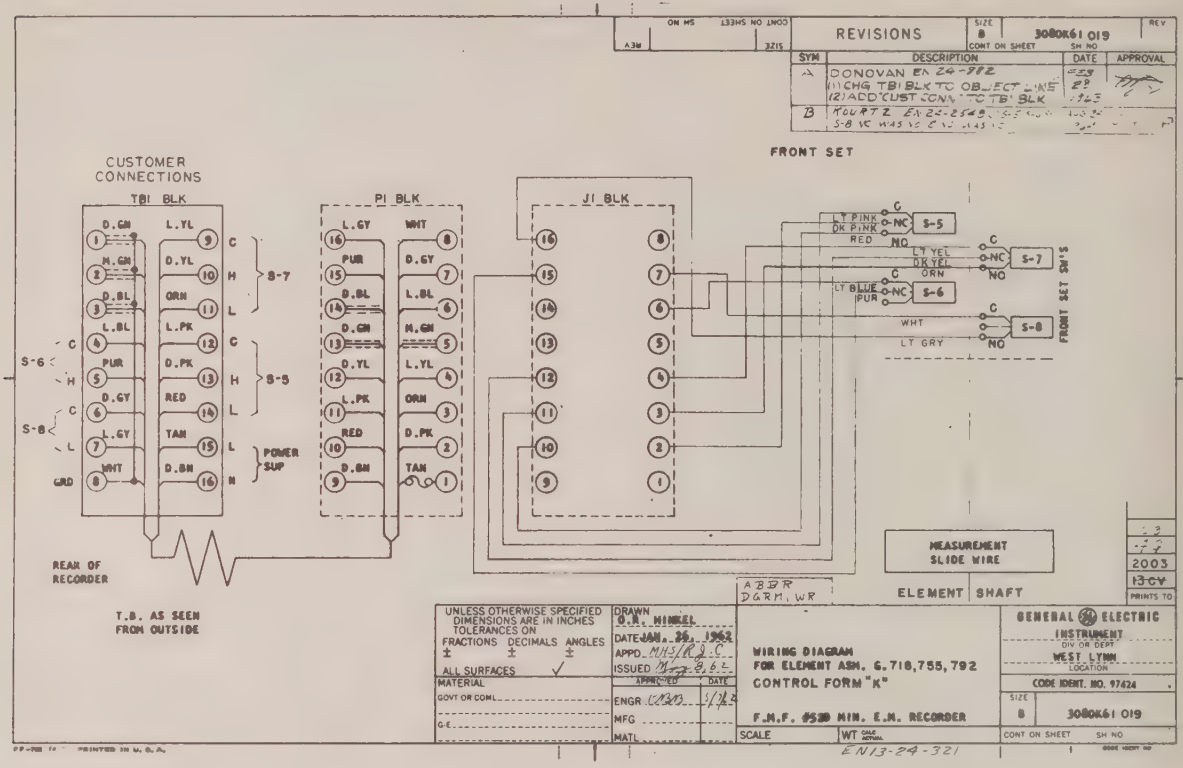


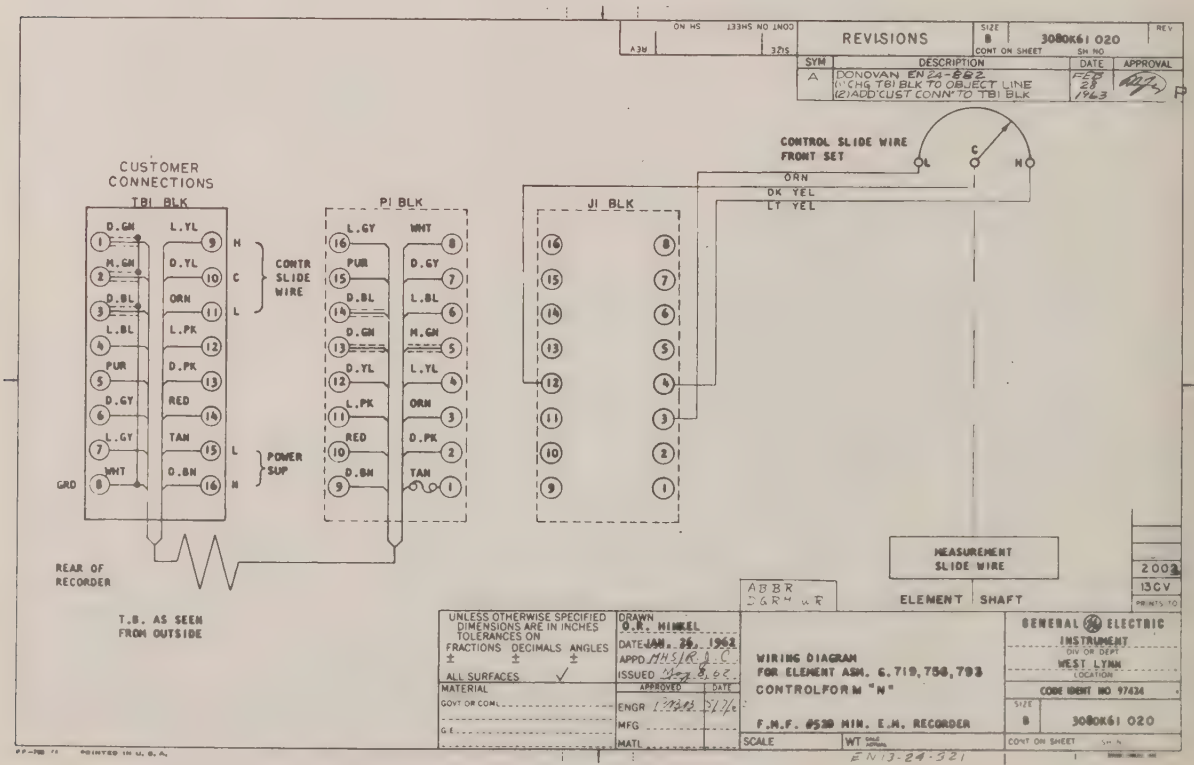


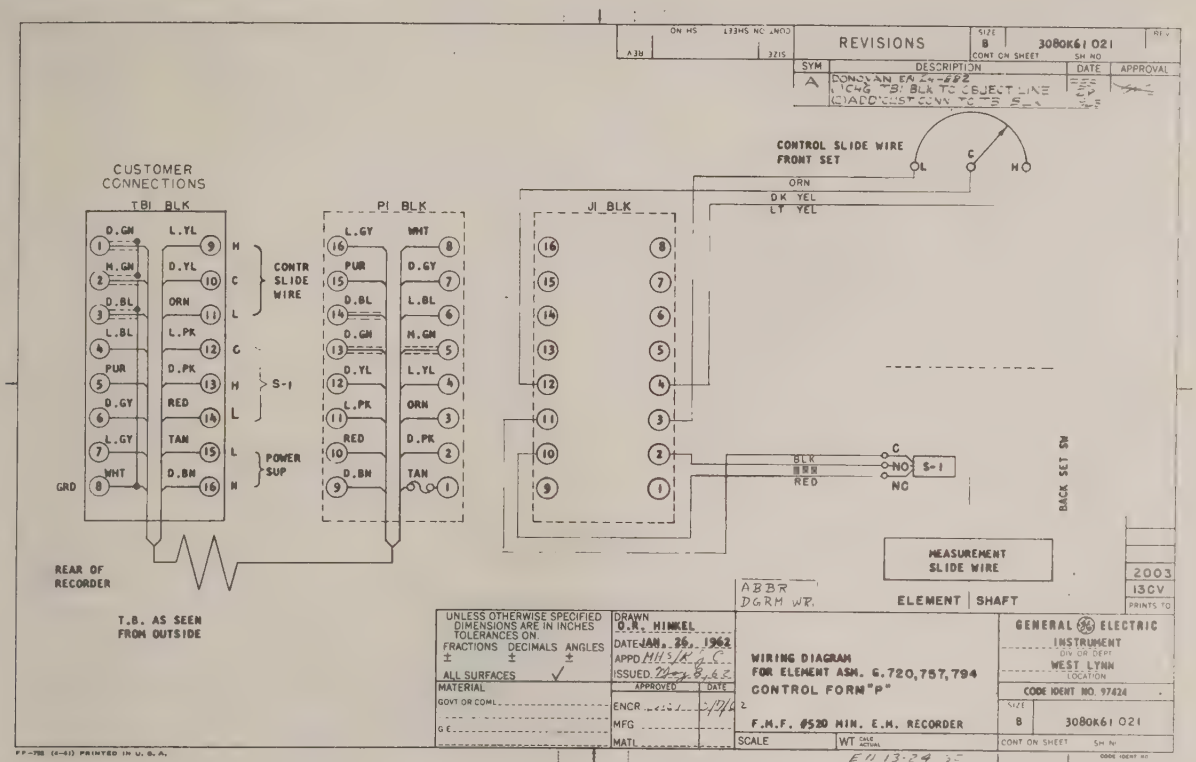

REVISIONS
SIZE B 3080K61 017
SYM DESCRIPTION DATE APPROVAL
A DONCVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN "C TBI BLK
B KOURTZ EN 24-2548 (1) S-5,S-6,S-7 NC WAS NO "C" WAS "C"
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
FRONT SET
S-1
S-5
S-6
S-7
POWER SUP
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
FRONT SET SW'S
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: FRACTIONS DECIMALS ANGLES
ALL SURFACES
MATERIAL
GOVT OR COML
GE
DRAWN D.R. HINKEL
DATE JAN. 26, 1962
APPD MH 5/18 J.C.
ISSUED May 8, 62
APPROVED DATE
ENGR 12-3-62 5/7/62
MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.716,753,790
CONTROL FORM "H"
F.M.F. 8520 MIN. E.M. RECORDER
SCALE
WT
CONT ON SHEET
SH NO
GENERAL ELECTRIC INSTRUMENT
DIV OR DEPT
WEST LYNN
LOCATION
CODE IDENT. NO. 97424
SIZE B 3080K61 017
PRINTS TO
EN13-24-321

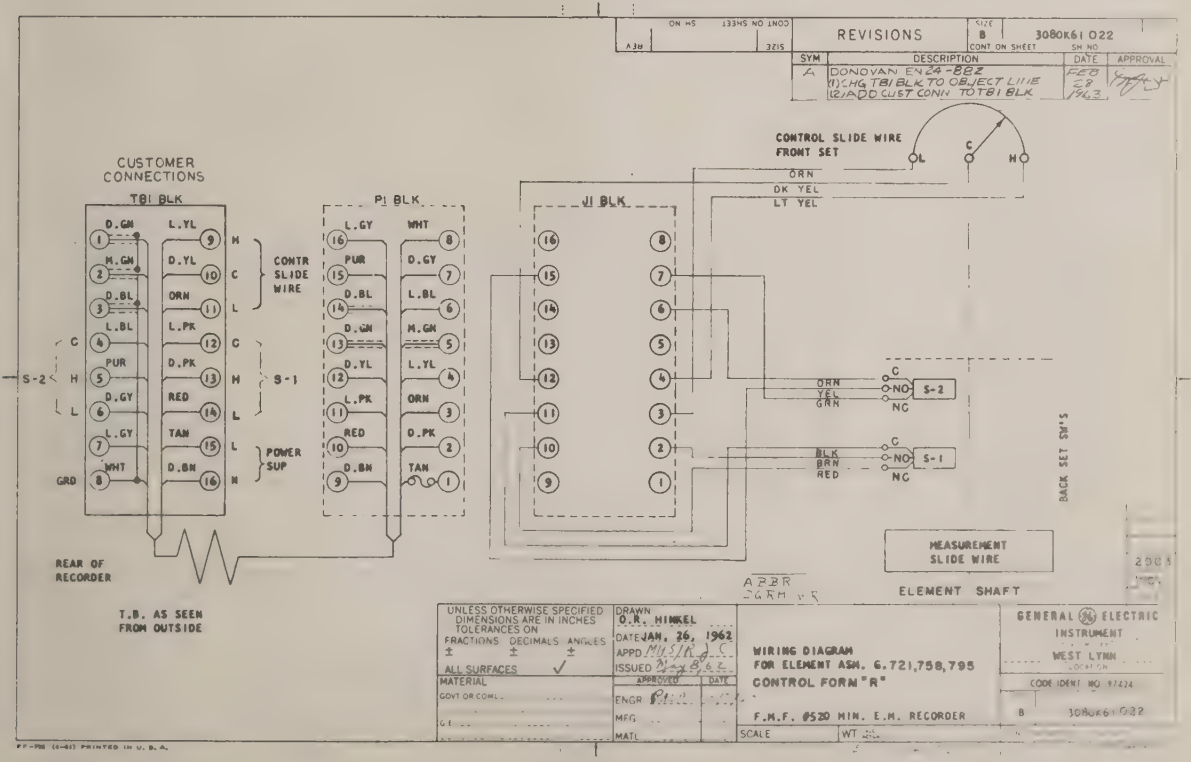

REVISIONS
SIZE B 3080K61 018
SYM DESCRIPTION DATE APPROVAL
A DONCVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN "C TBI BLK FEB 28 1963
B KOURTZ EN 24-2548 (1) S-5,S-6,S-7 NC WAS NO "C NO" WAS "NC" AUG 29 1964 O.K.
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
FRONT SET
S-1
S-5
S-6
S-7
POWER SUP
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
FRONT SET SW'S
BACK SET SW
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: FRACTIONS DECIMALS ANGLES
ALL SURFACES
MATERIAL
GOVT OR COML
GE
DRAWN D.R. HINKEL
DATE JAN. 26, 1962
APPD MH 5/18 J.C.
ISSUED May 8, 62
APPROVED DATE
ENGR 12-3-62 5/7/62
MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.717,754,791
CONTROL FORM "J"
F.M.F. 8520 MIN. E.M. RECORDER
SCALE
WT
CONT ON SHEET
SH NO
GENERAL ELECTRIC INSTRUMENT
DIV OR DEPT
WEST LYNN
LOCATION
CODE IDENT NO 97424
SIZE B 3080K61 018
PRINTS TO
EN13-24-321

Alarm or Control-initiation Wiring Diagrams

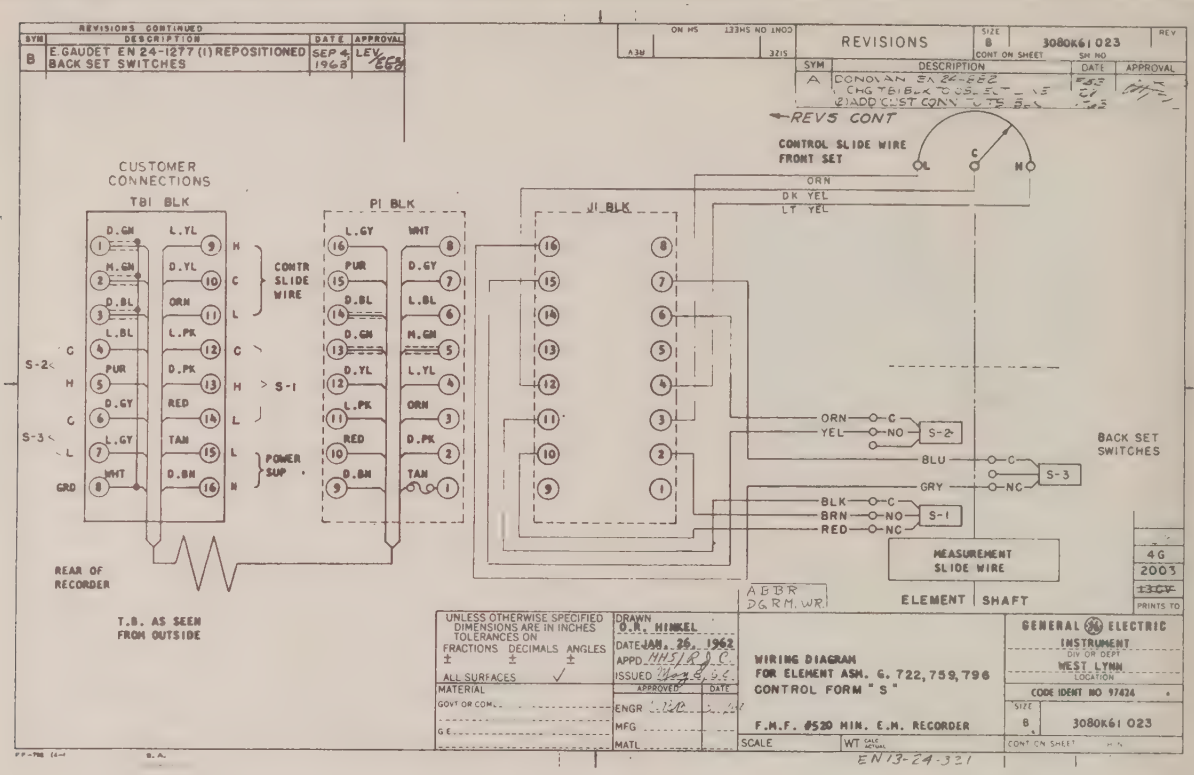

REVISIONS
SIZE B 3080K61 019
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK FEB 28 1963
B MOUNTZ EN 24-8588
FRONT SET
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
S-7 S-5 S-6 S-8 POWER SUP
LT PINK DK PINK RED
LT YEL DK YEL ORN
LT BLUE PUR
WHT LT GRY
FRONT SET S-W'S
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
ABBR DGRM. WR
2003
13CV
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓
MATERIAL
GOVT OR COML
G-E
DRAWN O.R. MINKEL
DATE JAN. 24, 1962
APPD. MHS/R.J.C.
ISSUED Nov. 8, 62
APPROVED DATE
ENGR CC320 2/26
MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.718,755,792 CONTROL FORM "K"
F.M.F. #530 MIN. E.M. RECORDER
SCALE
WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97424
SIZE B 3080K61 019
CONT ON SHEET SH NO
EN13-24-321

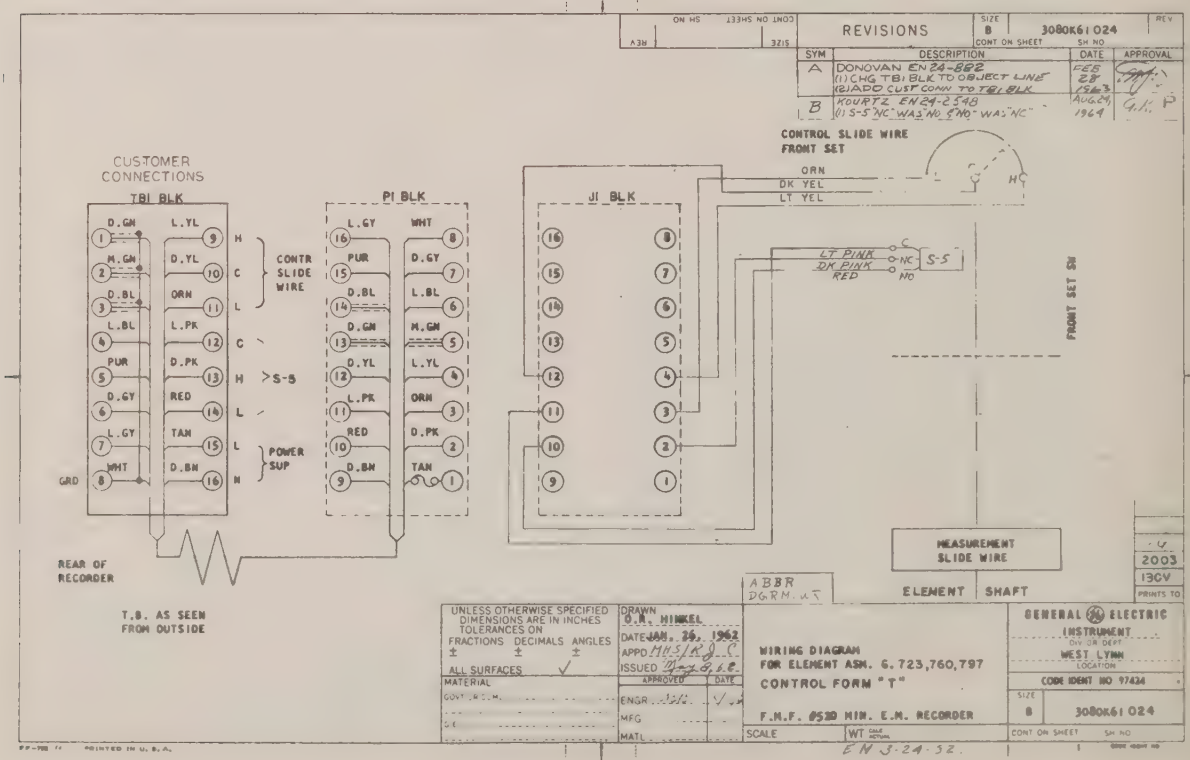

REVISIONS
SIZE B 3080K61 020
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TBI BLK TO OBJECT LINE (2) ADD CUST CONN TO TBI BLK FEB 28 1963
CONTROL SLIDE WIRE FRONT SET
CL C HL
ORN DK YEL LT YEL
CUSTOMER CONNECTIONS
TBI BLK
PI BLK
JI BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
CONTR SLIDE WIRE POWER SUP
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
ABBR DGRM. WR
2003
13CV
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓
MATERIAL
GOVT OR COML
G-E
DRAWN O.R. MINKEL
DATE JAN. 24, 1962
APPD. MHS/R.J.C.
ISSUED Nov. 8, 62
APPROVED DATE
ENGR 2/26
MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.719,758,793 CONTROL FORM "N"
F.M.F. #530 MIN. E.M. RECORDER
SCALE
WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97424
SIZE B 3080K61 020
CONT ON SHEET
EN13-24-321

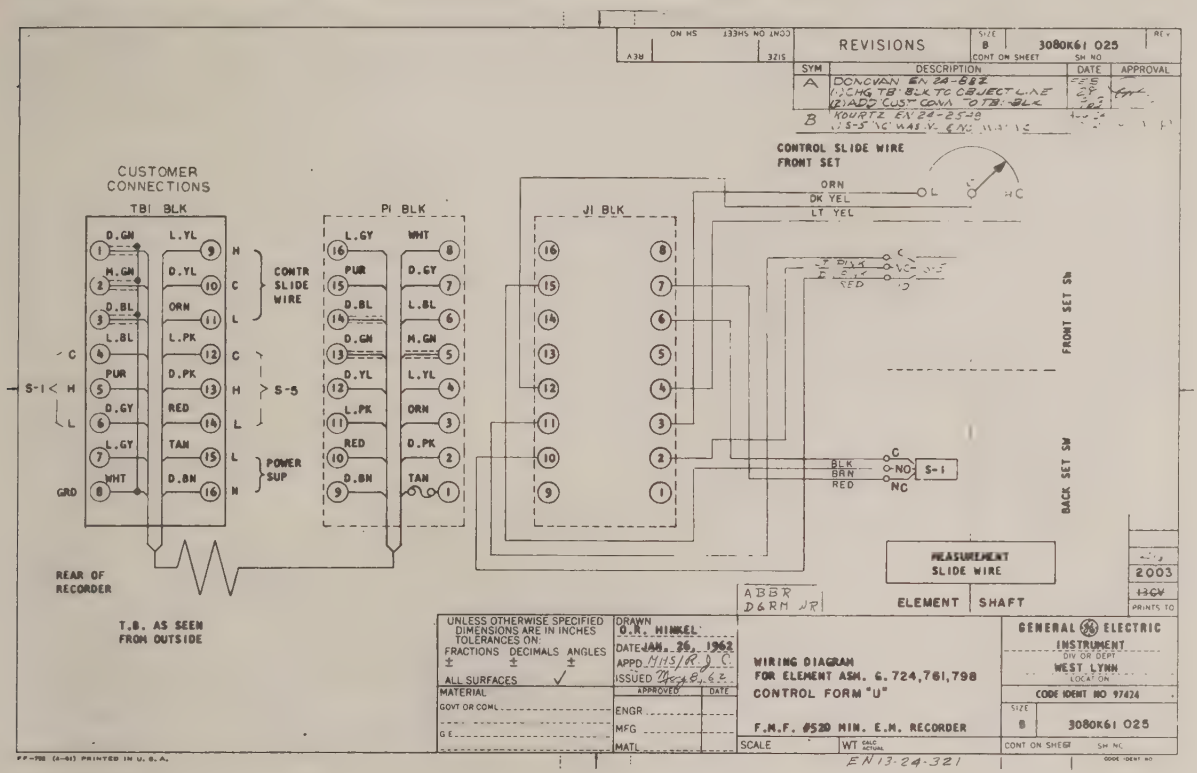

REVISIONS
SIZE B 3080K61 021
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TB1 BLK TO OBJECT LINE (2) ADD CUST CONN TO TB1 BLK
CONTROL SLIDE WIRE FRONT SET
CUSTOMER CONNECTIONS
TB1 BLK
P1 BLK
J1 BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN GRD
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
CONTR SLIDE WIRE
S-1
POWER SUP
ORN
DK YEL
LT YEL
BLK
BRN
RED
NO
NC
S-1
BACK SET SW
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
2003
13CV
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ALL SURFACES
DRAWN O.R. HINKEL
DATE JAN. 26, 1962
APPD
ISSUED
MATERIAL
APPROVED DATE
GOVT OR COML
ENGR
MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.720,757,794 CONTROL FORM "P"
F.M.F. #520 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT
WEST LYNN
CODE IDENT NO. 97424
SIZE B 3080K61 021
CONT ON SHEET SH NO

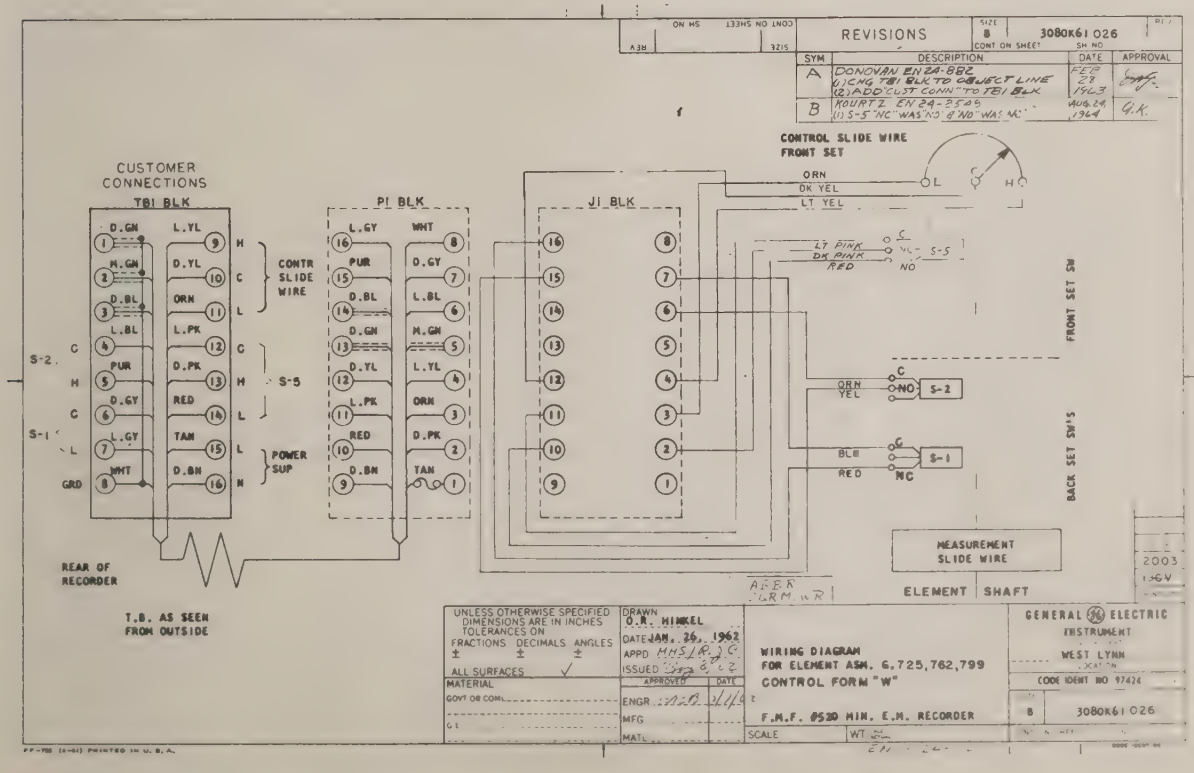

REVISIONS
SIZE B 3080K61 022
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TB1 BLK TO OBJECT LINE (2) ADD CUST CONN TO TB1 BLK FEB 28 1963
CONTROL SLIDE WIRE FRONT SET
CUSTOMER CONNECTIONS
TB1 BLK
P1 BLK
J1 BLK
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN GRD
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
CONTR SLIDE WIRE
S-1
POWER SUP
S-2
C
H
L
ORN
DK YEL
LT YEL
ORN
YEL
GRN
BLK
BRN
RED
NO
NC
S-2
S-1
BACK SET SW'S
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
2003
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ALL SURFACES
DRAWN O.R. HINKEL
DATE JAN. 26, 1962
APPD
ISSUED
MATERIAL
APPROVED DATE
GOVT OR COML
ENGR
MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. 6.721,758,795 CONTROL FORM "R"
F.M.F. #520 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT
WEST LYNN
CODE IDENT NO. 97424
B 3080K61 022

Alarm or Control-initiation Wiring Diagrams

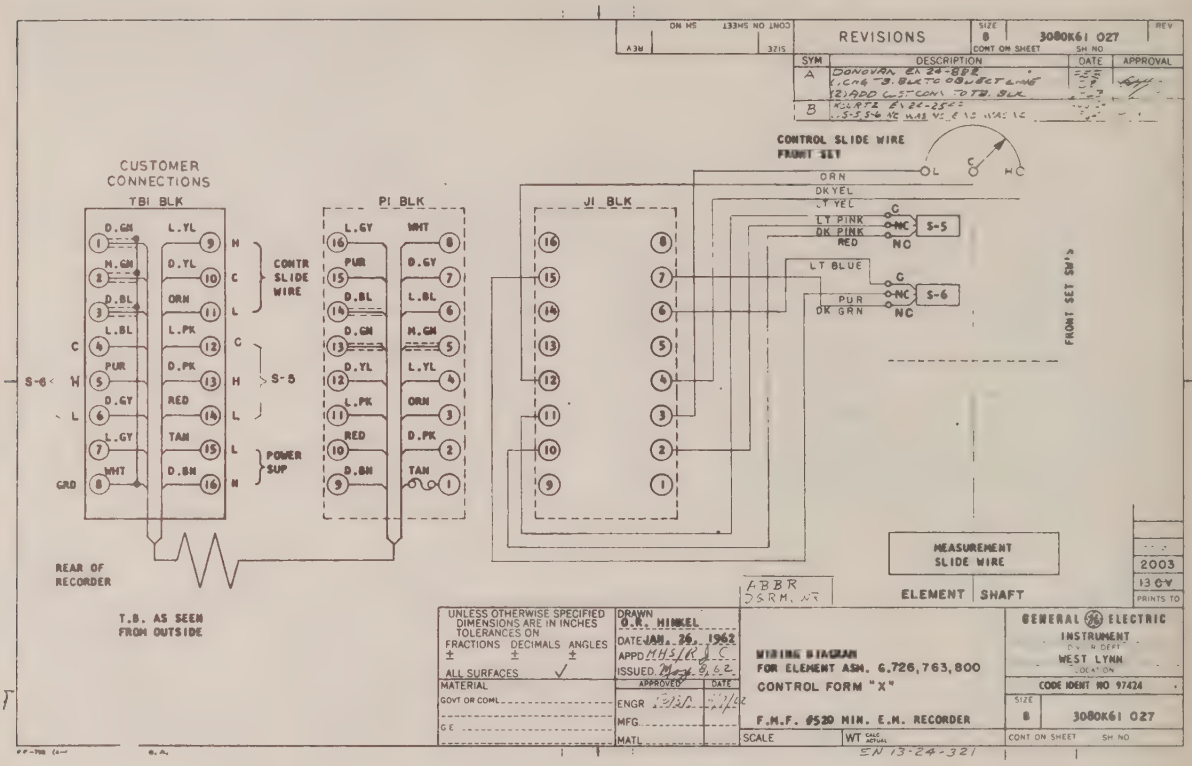


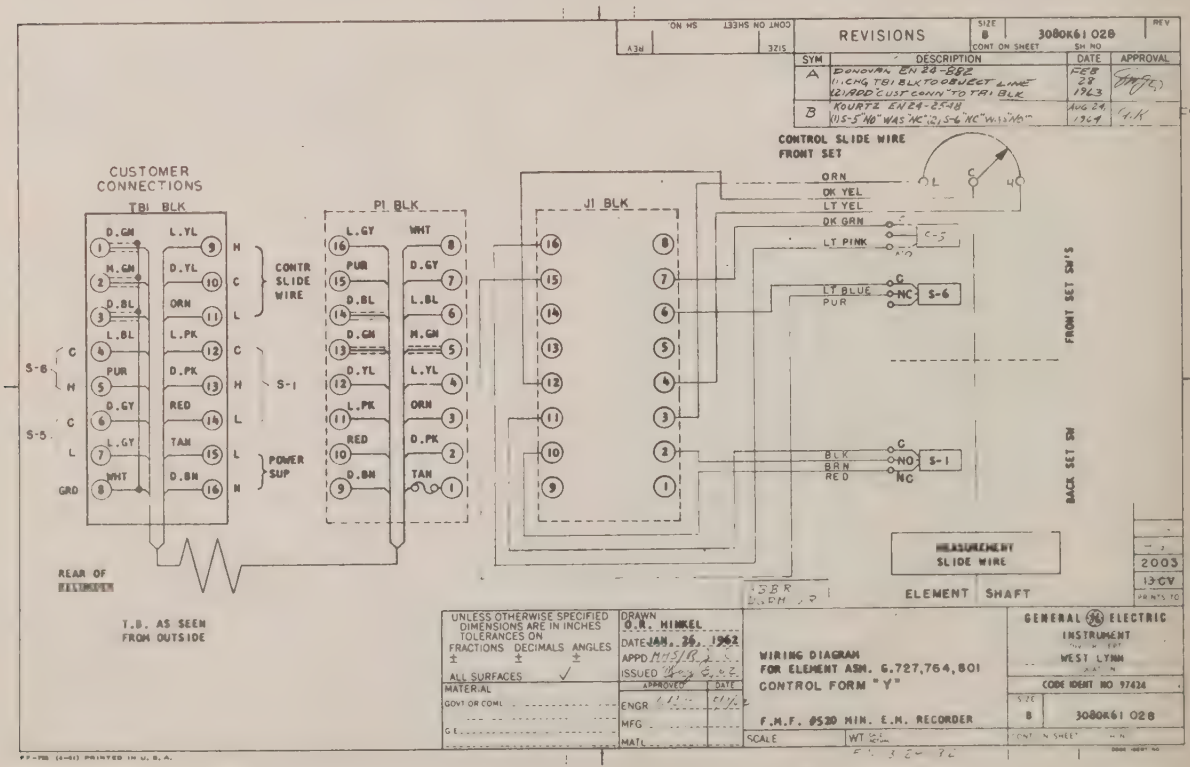

REVISIONS
A DONOVAN EN 24-882 (1) CHG TB1 BLK TO OBJECT LINE (2) ADD CUST CONN TO TB1 BLK
B KOURTZ EN 24-2540 (1) S-5 NC WAS NO & NO WAS NC
CONTROL SLIDE WIRE FRONT SET
CUSTOMER CONNECTIONS
TB1 BLK
P1 BLK
J1 BLK
CONTR SLIDE WIRE
POWER SUP
S-5
FRONT SET SW
MEASUREMENT SLIDE WIRE
ELEMENT
SHAFT
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
WIRING DIAGRAM FOR ELEMENT ASM. G. 723, 760, 797
CONTROL FORM "T"
F.M.F. #520 MIN. E.M. RECORDER
3080K61 024
EN 3-24-32

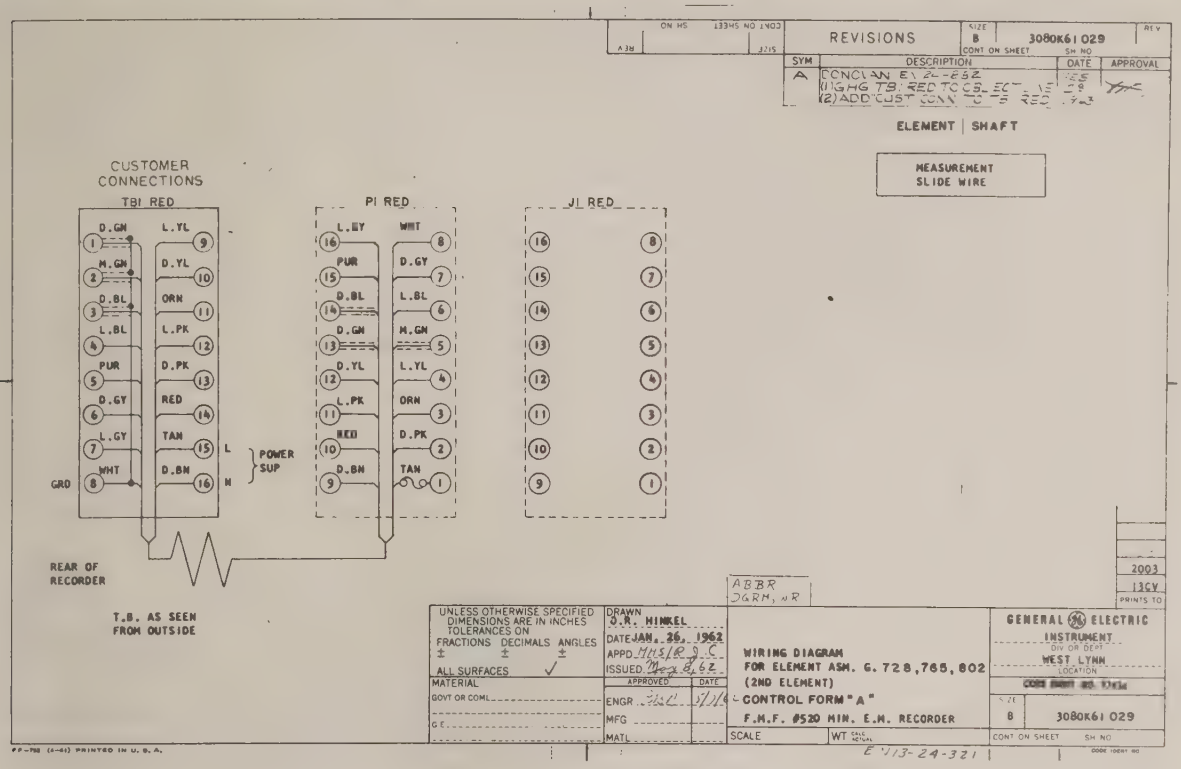

REVISIONS
SIZE B 3080K61 025
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TB1 BLK TO OBJECT LINE (2) ADD CUST CONN TO TB1 BLK
B KOURTZ EN 24-2509 (1) S-5 "NC" WAS "NO" & "NO" WAS "NC"
CONTROL SLIDE WIRE FRONT SET
CUSTOMER CONNECTIONS
TB1 BLK
P1 BLK
J1 BLK
CONTR SLIDE WIRE
POWER SUP
S-5
S-1
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
FRONT SET SW
BACK SET SW
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓
MATERIAL
DRAWN O.R. HINKEL
DATE JAN. 26, 1962
APPD MNSLR.J.C.
ISSUED Mar 8, 62
APPROVED DATE
ENGR
MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. G. 724,761,798
CONTROL FORM "U"
F.M.F. #520 MIN. E.M. RECORDER
SCALE
WT
GENERAL ELECTRIC INSTRUMENT
WEST LYNN
CODE IDENT NO 97424
SIZE B 3080K61 025
EN13-24-321

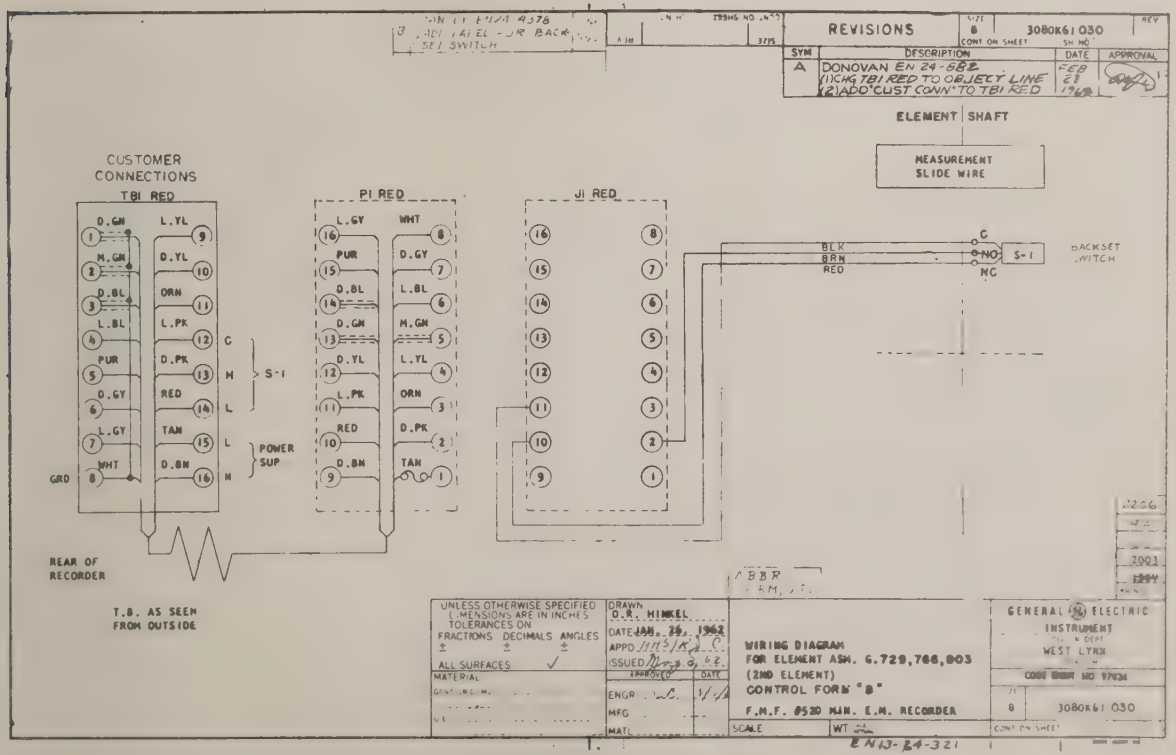

REVISIONS
SIZE B 3080K61 026
SYM DESCRIPTION DATE APPROVAL
A DONOVAN EN 24-882 (1) CHG TB1 BLK TO OBJECT LINE (2) ADD CUST CONN TO TB1 BLK
B KOURTZ EN 24-2509 (1) S-5 "NC" WAS "NO" & "NO" WAS "NC"
CONTROL SLIDE WIRE FRONT SET
CUSTOMER CONNECTIONS
TB1 BLK
P1 BLK
J1 BLK
CONTR SLIDE WIRE
POWER SUP
S-5
S-2
S-1
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
MEASUREMENT SLIDE WIRE
ELEMENT SHAFT
FRONT SET SW
BACK SET SW'S
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± ALL SURFACES ✓
MATERIAL
DRAWN O.R. HINKEL
DATE JAN. 26, 1962
APPD MNSLR.J.C.
ISSUED Mar 8, 62
APPROVED DATE
ENGR
MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. G. 725,762,799
CONTROL FORM "W"
F.M.F. #520 MIN. E.M. RECORDER
SCALE
WT
GENERAL ELECTRIC INSTRUMENT
WEST LYNN
CODE IDENT NO 97424
SIZE B 3080K61 026

Alarm or Control-initiation Wiring Diagrams

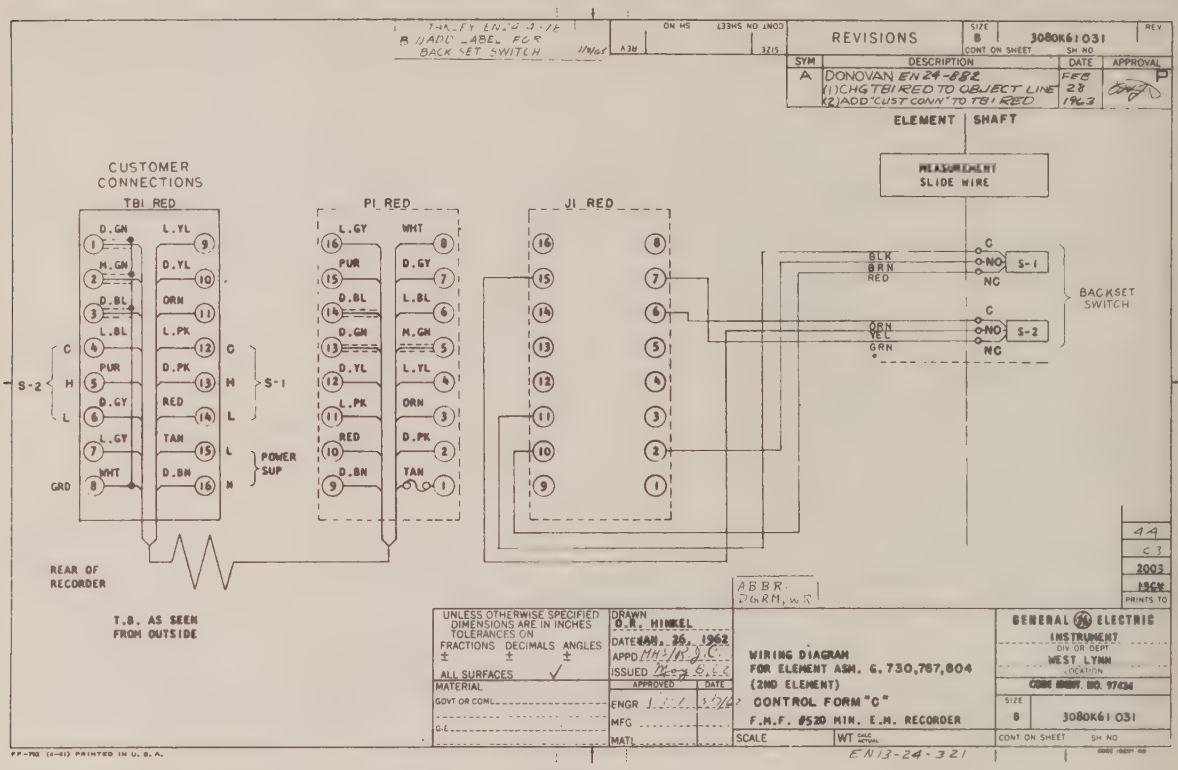


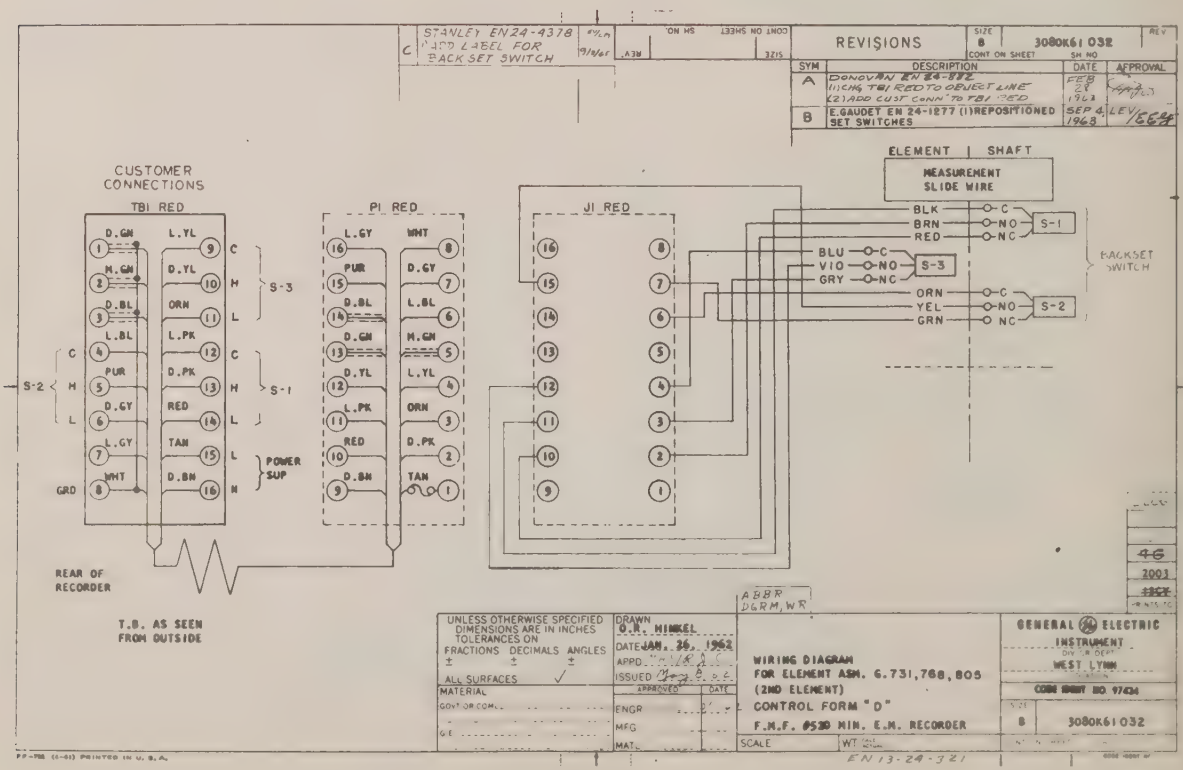


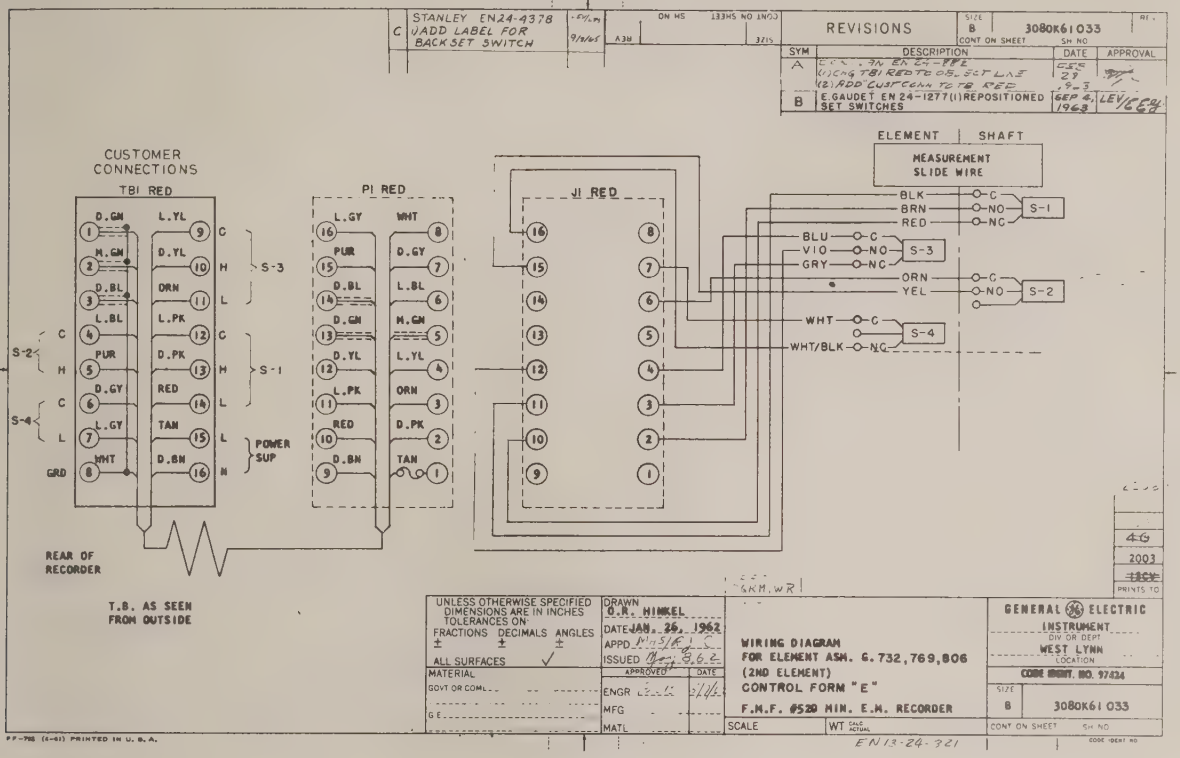

REVISIONS
SIZE B 3080K61 029 REV
SYM A
DESCRIPTION
DONOVAN EN 24-682
(1)CHG TBI RED TO OBJECT LINE
(2)ADD CUST CONN TO TBI RED
DATE FEB 28 1962
APPROVAL
ELEMENT | SHAFT
MEASUREMENT SLIDE WIRE
CUSTOMER CONNECTIONS
TBI RED
PI RED
JI RED
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
POWER SUP
L
N
GRD
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS DECIMALS ANGLES
ALL SURFACES
MATERIAL
DRAWN O.R. HINKEL
DATE JAN. 26, 1962
APPD M.H.S.I.R. J.C.
ISSUED May 8, 62
APPROVED DATE
ENGR J.C. 5/1/62
MFG
MATL
WIRING DIAGRAM
FOR ELEMENT ASM. G. 728,765,802
(2ND ELEMENT)
CONTROL FORM "A"
F.M.F. #520 MIN. E.M. RECORDER
SCALE
WT
GENERAL ELECTRIC
INSTRUMENT
DIV OR DEPT
WEST LYNN
LOCATION
CODE IDENT NO 97634
SIZE B 3080K61 029
CONT ON SHEET SH NO
CODE IDENT NO
PRINTS TO
2003
13GY
ABBR
DRWN
E 113-24-321


REVISIONS
SIZE B 3080K61 030 REV
SYM A
DESCRIPTION
DONOVAN EN 24-682
(1)CHG TBI RED TO OBJECT LINE
(2)ADD CUST CONN TO TBI RED
DATE FEB 28 1962
APPROVAL
ELEMENT | SHAFT
MEASUREMENT SLIDE WIRE
CUSTOMER CONNECTIONS
TBI RED
PI RED
JI RED
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
C
M
L
S-1
POWER SUP
N
GRD
BLK
GRN
RED
NO
NC
BACKSET SWITCH
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS DECIMALS ANGLES
ALL SURFACES
MATERIAL
DRAWN O.R. HINKEL
DATE JAN. 26, 1962
APPD M.H.S.I.R. J.C.
ISSUED May 8, 62
APPROVED DATE
ENGR J.C. 5/1/62
MFG
MATL
WIRING DIAGRAM
FOR ELEMENT ASM. G. 729,766,803
(2ND ELEMENT)
CONTROL FORM "B"
F.M.F. #520 MIN. E.M. RECORDER
SCALE
WT
GENERAL ELECTRIC
INSTRUMENT
DIV OR DEPT
WEST LYNN
LOCATION
CODE IDENT NO 97634
SIZE B 3080K61 030
CONT ON SHEET SH NO
2006
2003
E 113-24-321

Alarm or Control-initiation Wiring Diagrams






C STANLEY EN24-4378 ADD LABEL FOR BACK SET SWITCH 9/9/65
REVISIONS
SIZE B 3080K61033
SYM A DESCRIPTION: DONOVAN EN 24-882 (1)CHG TBI RED TO OBJECT LINE (2)ADD CUST CONN TO TB RED DATE FEB 28 1963 APPROVAL
B E.GAUDET EN 24-1277(1) REPOSITIONED SET SWITCHES SEP 4, 1963
CUSTOMER CONNECTIONS
TBI RED
PI RED
JI RED
ELEMENT SHAFT
MEASUREMENT SLIDE WIRE
BLK C NO NC S-1
BRN
RED
BLU C NO NC S-3
VIO
GRY
ORN C NO S-2
YEL
WHT C NO S-4
WHT/BLK NC
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
S-3 S-1 S-2 S-4 POWER SUP GRD
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± DECIMALS ± ANGLES ± ALL SURFACES ✓
MATERIAL GOVT OR COML GE
DRAWN O.R. HINKEL DATE JAN. 26, 1962 APPD M.S. ISSUED May 3, 62
APPROVED DATE ENGR MFG MATL
WIRING DIAGRAM FOR ELEMENT ASM. G.732,769,806 (2ND ELEMENT) CONTROL FORM "E" F.M.F. #520 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97434
SIZE B 3080K61033
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EN13-24-321
2003
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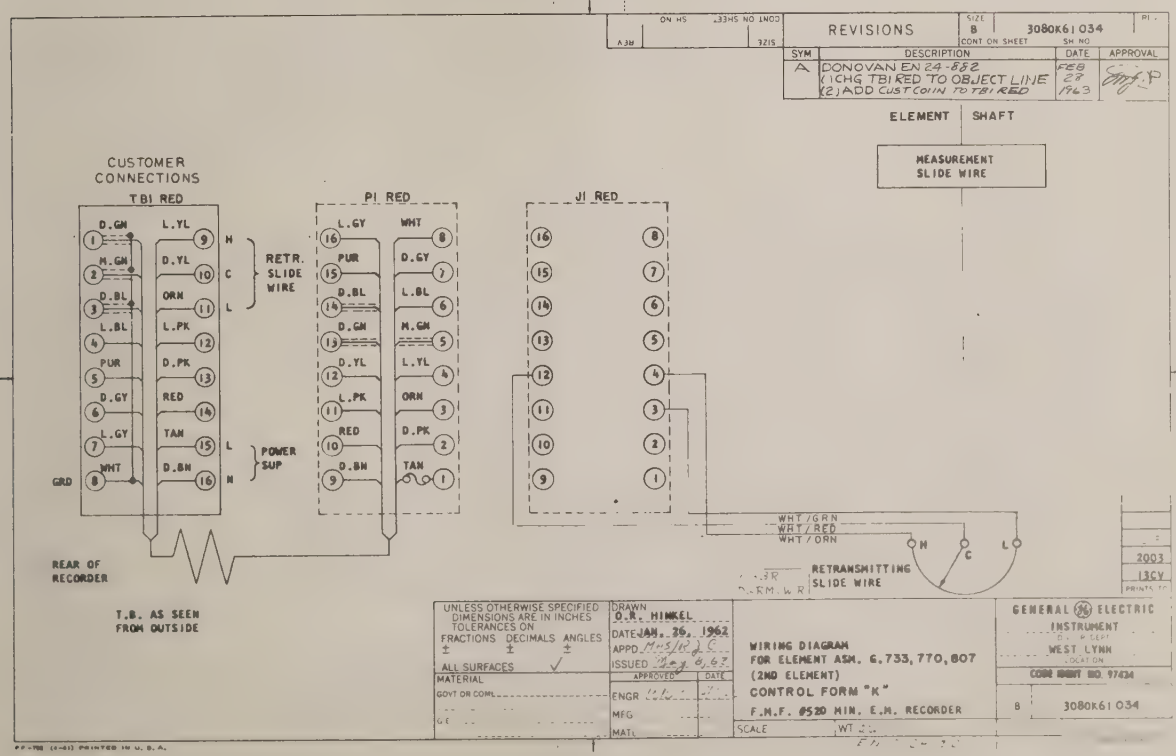
REVISIONS
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ELEMENT SHAFT
MEASUREMENT SLIDE WIRE
CUSTOMER CONNECTIONS
TBI RED
PI RED
JI RED
D.GN L.YL M.GN D.YL D.BL ORN L.BL L.PK PUR D.PK D.GY RED L.GY TAN WHT D.BN
RETR. SLIDE WIRE POWER SUP GRD
L.GY WHT PUR D.GY D.BL L.BL D.GN M.GN D.YL L.YL L.PK ORN RED D.PK D.BN TAN
WHT/GRN WHT/RED WHT/ORN H C L
RETRANSMITTING SLIDE WIRE
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± DECIMALS ± ANGLES ± ALL SURFACES ✓
MATERIAL GOVT OR COML GE
DRAWN O.R. HINKEL DATE JAN. 26, 1962 APPD M.S. ISSUED May 8, 63
APPROVED DATE ENGR MFG MATL
WIRING DIAGRAM FOR ELEMENT ASM. G.733,770,807 (2ND ELEMENT) CONTROL FORM "K" F.M.F. #520 MIN. E.M. RECORDER
SCALE WT
GENERAL ELECTRIC INSTRUMENT DIV OR DEPT WEST LYNN LOCATION
CODE IDENT. NO. 97434
SIZE B 3080K61034
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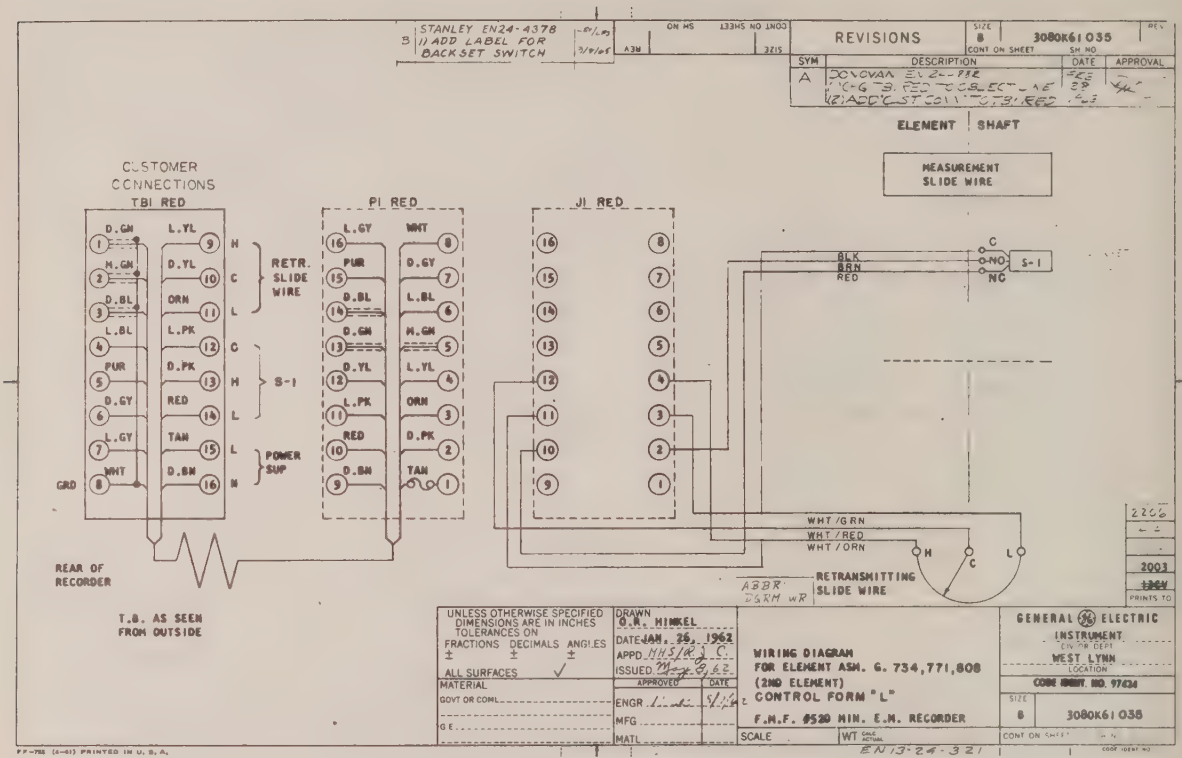
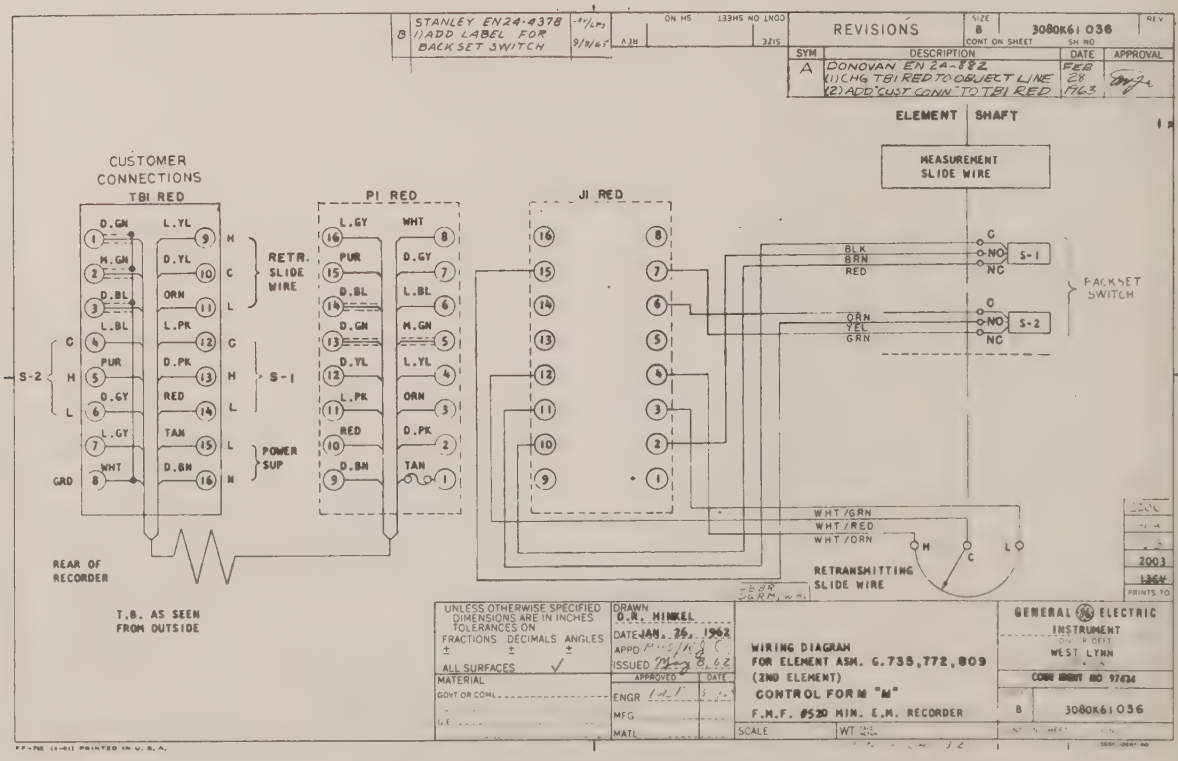
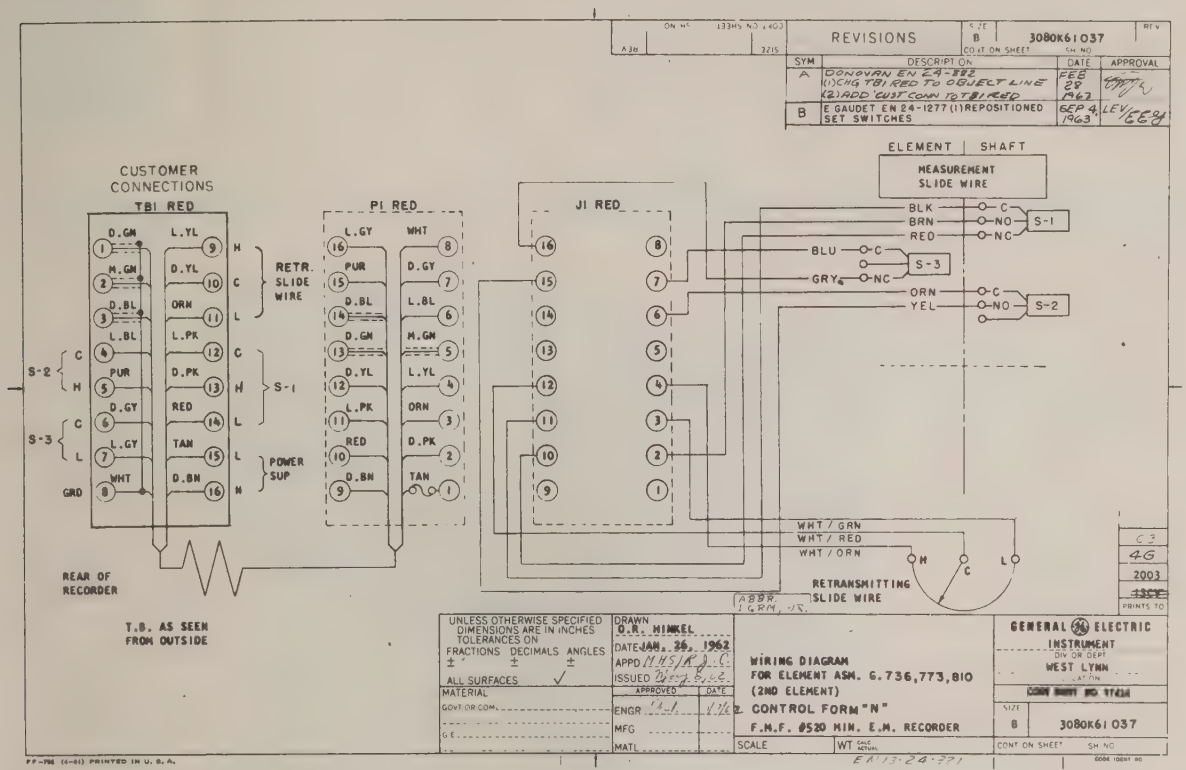
PRINTS TO

Alarm or Control-initiation Wiring Diagrams



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SIZE B
3080K61037
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DATE
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A
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(1) CHG TB1 RED TO OBJECT LINE
(2) ADD 'CUST CONN TO TB1 RED
FEB 28 1962
B
E GAUDET EN 24-1277 (1) REPOSITIONED SET SWITCHES
SEP 4, 1963
CUSTOMER CONNECTIONS
TB1 RED
P1 RED
J1 RED
ELEMENT | SHAFT
MEASUREMENT SLIDE WIRE
BLK
BRN
RED
BLU
GRY
ORN
YEL
S-1
S-2
S-3
RETR. SLIDE WIRE
POWER SUP
WHT / GRN
WHT / RED
WHT / ORN
RETRANSMITTING SLIDE WIRE
REAR OF RECORDER
T.B. AS SEEN FROM OUTSIDE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS DECIMALS ANGLES
ALL SURFACES
MATERIAL
DRAWN Q.R. MINKEL
DATE JAN. 26, 1962
APPD
ISSUED
APPROVED DATE
ENGR
MFG
MATL
WIRING DIAGRAM FOR ELEMENT ASM. G.736,773,810 (2ND ELEMENT)
F.M.F. #520 MIN. E.M. RECORDER
CONTROL FORM "N"
SCALE
WT
GENERAL ELECTRIC
INSTRUMENT
WEST LYNN
SIZE B
3080K61037
EA-13-24-771

INSTRUMENT DEPARTMENT
GENERAL ELECTRIC
WEST LYNN, MASS.

38-100

Printed in U.S.A.

INSTRUCTIONS

198 4530K40-001D
Supersedes 4530K40-001C

TYPE 520
STRIP-CHART RECORDER
GENERAL INFORMATION

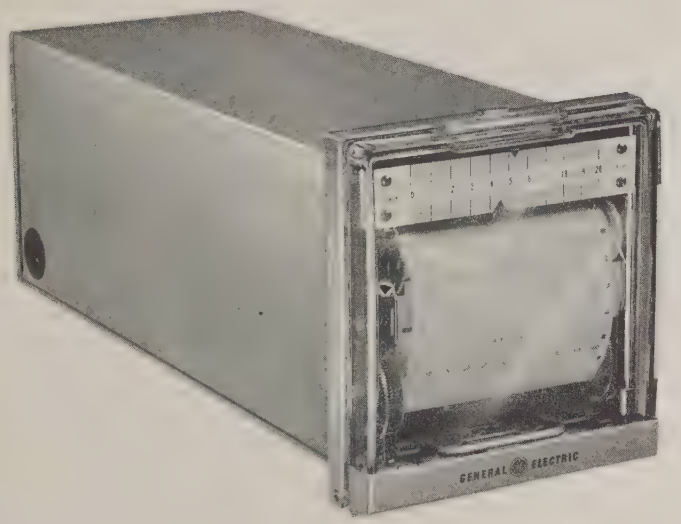

Fig. 1. Typical Type 520 Recorder

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NOTE: Data in this publication has been revised as of December, 1965.

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These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

GENERAL ELECTRIC

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INTRODUCTION

These instructions cover the installation, operation, and maintenance of the General Electric Type 520 Strip-chart Recorder. These instructions provide information which is common to all Type 520 recorders, but do not cover the recorder measuring circuit. Refer to the Specific Information publication in the composite instructions shipped with each recorder for measuring-circuit information and calibration instructions.

The Type 520 recorder is a strip-chart, single-pen, ink-type instrument designed for semi-flush mounting on either a vertical panel or a sloping panel. It is a general purpose, servo-operated, null-balance recorder, suitable for measuring a wide range of variables. The recorder can be provided with a control slidewire for operation with a G-E Type 524 Electric Controller, or with a transmitting slidewire for remote indication. Up to eight snap-action switches can be provided for control, alarm, or other functions.

Refer to the recorder rating plate for the recorder operating voltage and frequency requirements. The recorder rating plate is located on the base underneath the chart carriage.

RECEIVING, HANDLING, AND STORAGE

RECEIVING

On receipt of the recorder, examine it immediately for any damage that might have occurred in transit. Immediate examination is especially important if rough handling is evident. If damage is found, a damage claim should be filed immediately with the transportation company, and the nearest General Electric sales office should be notified promptly.

The following supplies are shipped with each recorder:

Quantity	Item	Catalog Number
1	Record chart roll	(Printed on chart roll)
3	Inkwell	4496K60-700
2	Hex-head wrenches	9087K43-003
2	Hex-head wrenches	9087K43-004
1	Pen starter	1834K61-701
1	Pen cleaner	2366K60-700
1	Bottle of ink	1656K60-700
1	Fill spout (for ink bottle)	2060K60-700
1	Vial (slide wire lubricant)	CSJYA80055

HANDLING

The recorder weighs between 25 and 30 pounds, depending on the provisions in-

corporated. Do not subject the recorder to excessive jarring or shocks when moving it from one location to another.

STORAGE

If the recorder is to be stored prior to use, it should be repacked in its original packing material and container, if possible. Store it in an area free from corrosive vapors, excessive vibration and shock, and temperature extremes.

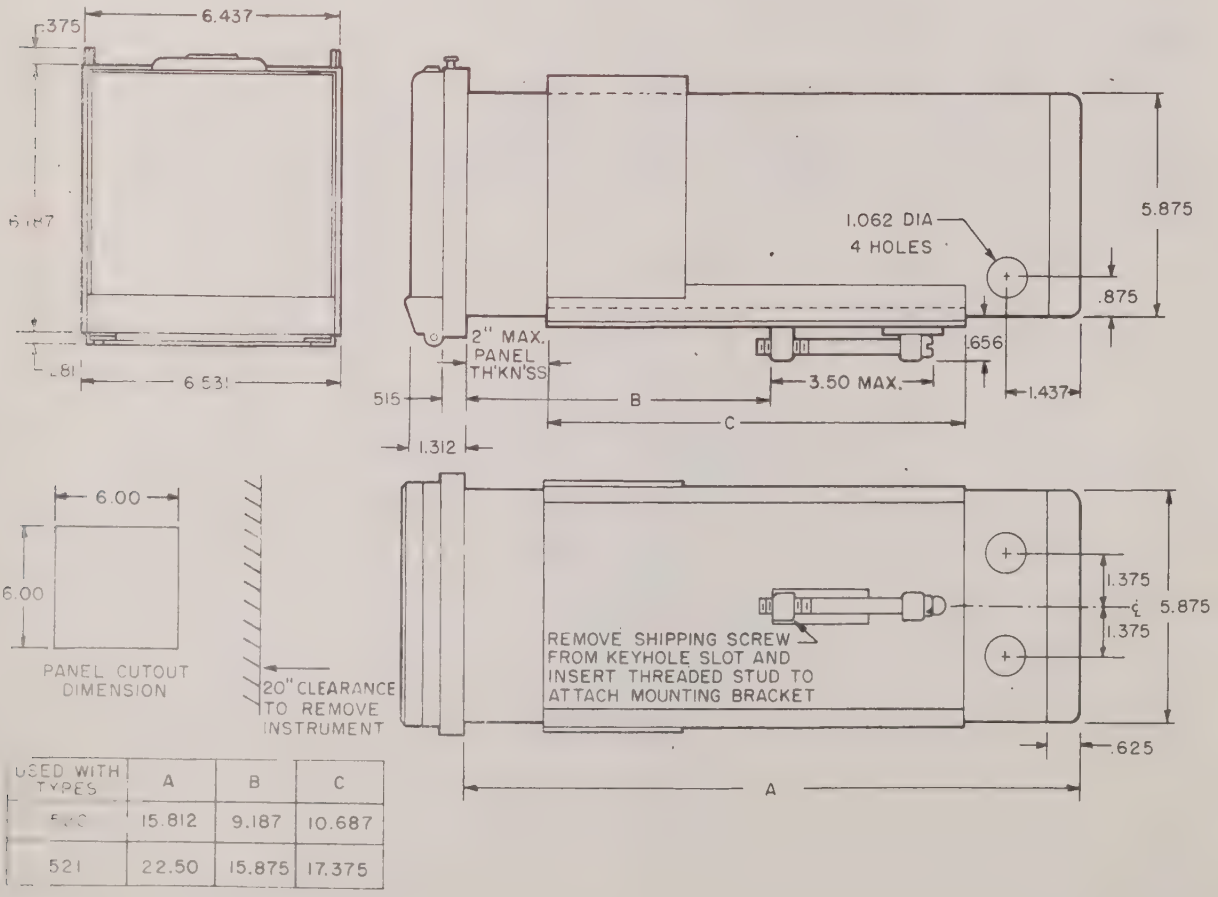
INSTALLATION

LOCATION

Install the recorder in an area free of high humidity, corrosive fumes, and excessive vibration. Mount the recorder at a reasonable distance from transformers or conductors which carry high currents.

MOUNTING

Outline and mounting dimensions, and panel-spacing dimensions are shown in Fig. 2 and Fig. 3.



USED WITH TYPES	A	B	C
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521	22.50	15.875	17.375

Fig. 2. Outline dimensions, typical strip-chart recorder

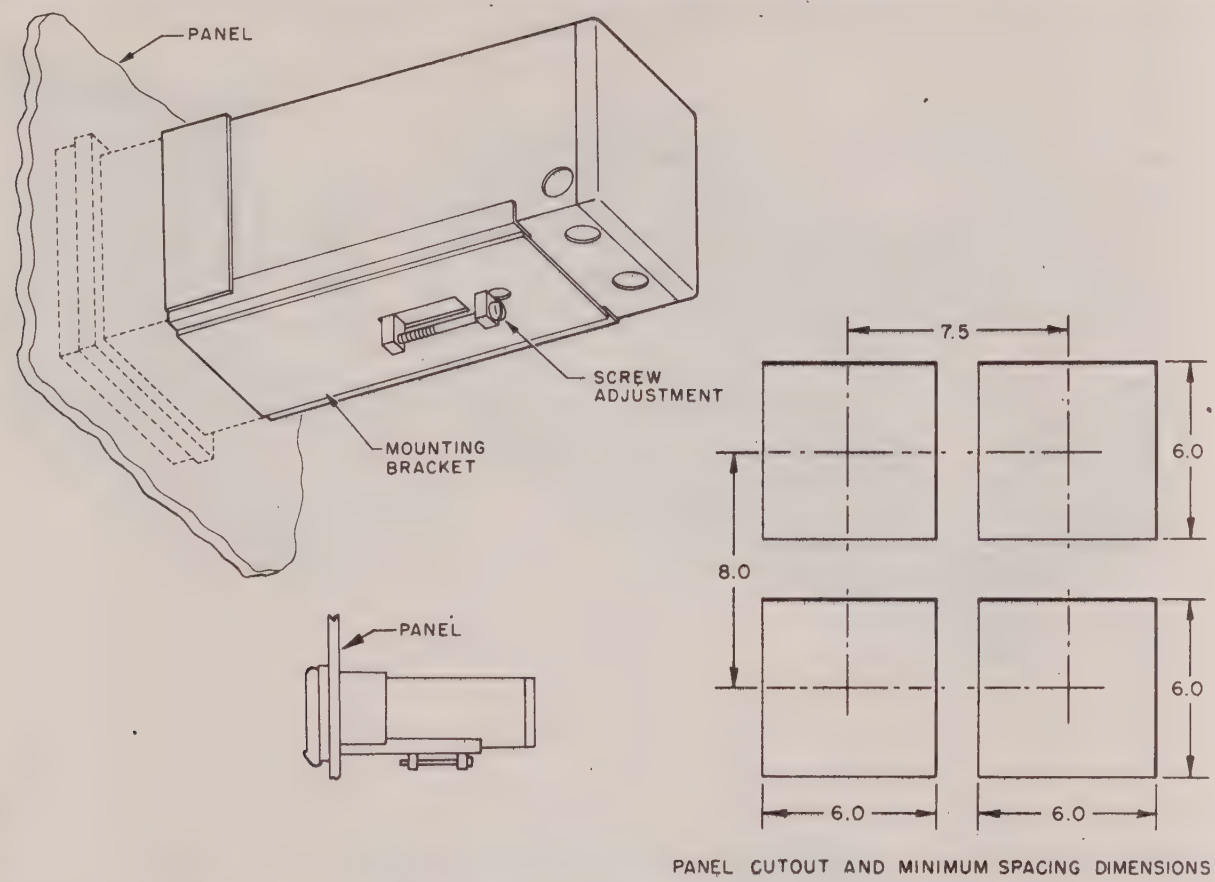


Fig. 3. Panel-mounting dimensions, typical strip-chart recorder

The recorder case can be mounted on the panel easily if the recorder assembly is first removed from the case, and the case is mounted as indicated in the following two sections.

IMPORTANT

The recorder must not be installed where the rear of the case will be higher than the front of the case. If mounted in a sloping panel, the slope of the panel must not exceed 75 degrees from the vertical axis.

Recorder-Assembly Removal (See Fig. 4)

Remove the recorder assembly from the case as follows:

1. Remove the shipping screw (see Fig. 2) from the keyhole slot in the underside of the case; then, open the cover by pressing the latch button on the top edge of the case. (Keep the shipping screw and shipping bushing to hold the recorder assembly properly if the recorder is to be reshipped.)

2. Press latch lever (17) and pull the recorder assembly out slowly, releasing the latch lever as the recorder assembly is pulled out. A click will be heard when the recorder assembly is halfway out. This is a safety-locked position to permit partial removal for servicing (see Fig. 4).

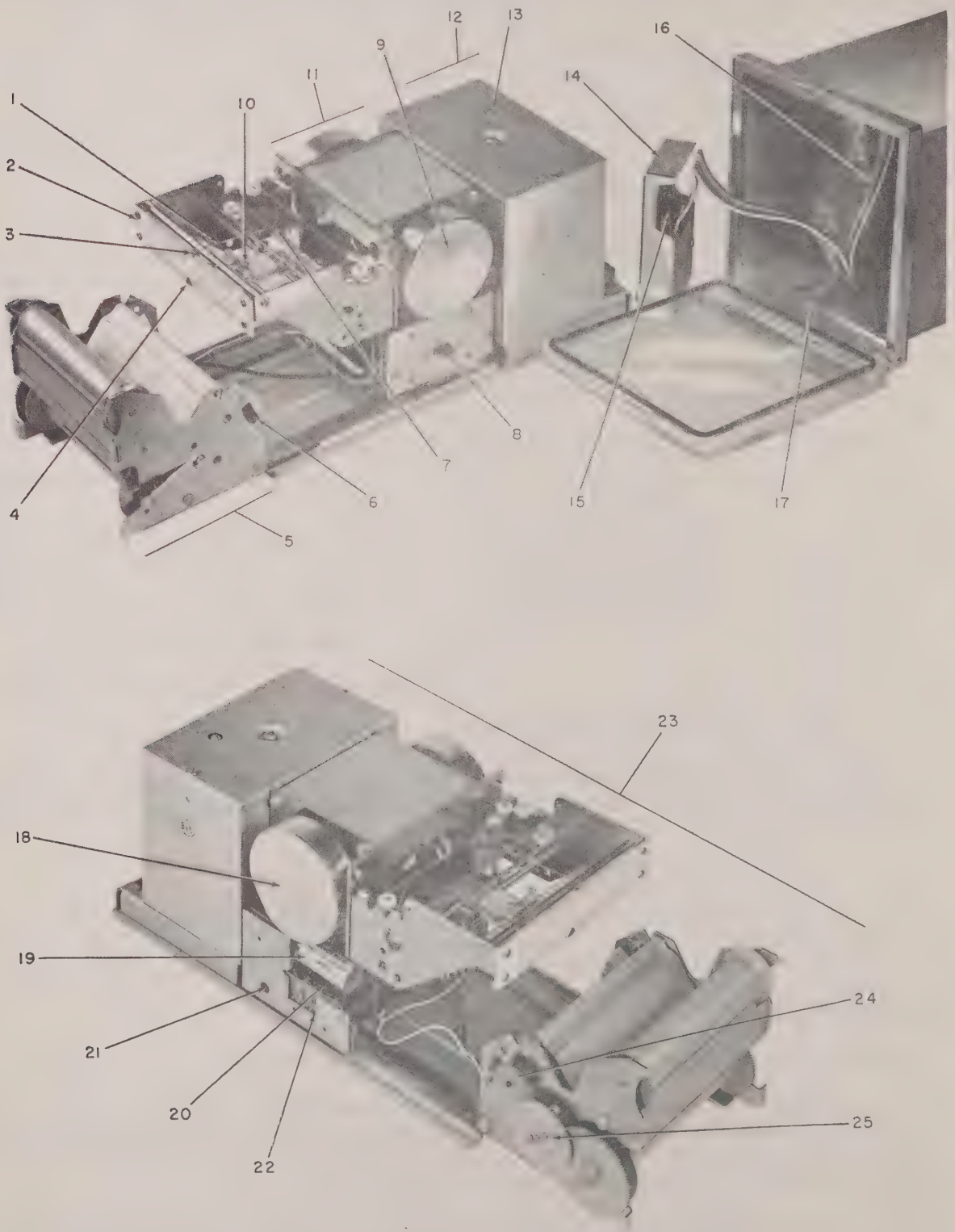


Fig. 4. Parts location, typical recorder

Legend for Fig. 4

1. Pen lifter
2. Scale
3. Set pointer
4. Pen pointer
5. Chart carriage (extended)
6. Chart-motor switch
7. Pen-lifter stops
8. Power switch
9. Control (or transmitting) slidewire assembly
10. Pen-and-inkwell assembly
11. Measurement-slidewire assembly
12. Amplifier section
13. Gain adjustment
14. Power plug
15. Fuse holder
16. Power cable
17. Latch lever
18. Measurement-slidewire cover
19. Range plug and reference board
20. Response-time adjuster (optional), under and behind range plug
21. Span adjustment
22. Test terminals
23. Recorder assembly
24. Chart-motor pinion
25. Idler gear

3. Press the latch lever again to release the recorder assembly, and support the recorder assembly at the base as it is withdrawn completely from the case.

4. Disconnect the power-cable plug (14) by pulling it off vertically (see Fig. 4).

Mounting the Case (See Fig. 2 and Fig. 3.)

Mount the empty case on the panel as follows:

1. Remove the mounting bracket from the recorder case and insert the case from the front of the panel; then, slide the mounting bracket on the case from the rear of the panel.

2. Insert the mounting stud (with the threaded hole in its center) in the keyhole slot in the bottom of the case.

3. Insert the bolt through the stud in the mounting bracket and thread it into the stud on the bottom of the case. Screw the bolt tight enough to hold the case firmly on the panel.

4. Reassemble the recorder assembly in the empty case by reversing the procedure in the foregoing Recorder-assembly Removal section.

CONNECTIONS

All electrical leads to the recorder should be enclosed in conduit or armored cable. Make sure that all connections are tight.

IMPORTANT

Do not install signal leads in same conduit with power leads.

External connections are made at the rear of the recorder case. The terminal-board cover can be removed after the two cover screws are loosened. Plug buttons are provided in the case for conduit or cable fittings. Refer to the recorder rating plate on the recorder assembly base behind the chart carriage inside the recorder case for the recorder voltage and frequency requirements. When replacing

the terminal-board cover on the rear of the case, make sure the two locking lugs engage the lip of the case before the cover screws are tightened.

External-connection diagrams of input-signal circuits and power circuits for potentiometric recorders are shown in Fig. 5. Refer to the measuring-circuit publication in the composite manual shipped with the recorder for connections of other types of recorders. The drawing number of the applicable external-connection diagram for special recorder applications is identified on the recorder rating plate, and a copy is sent to the customer as a part of the recorder requisition.

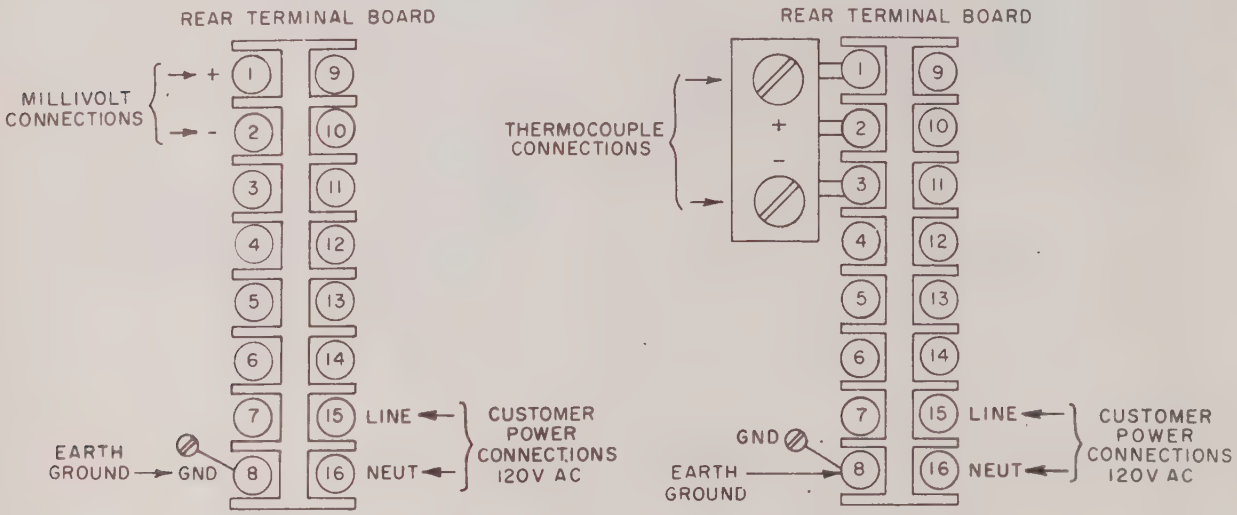


Fig. 5. Input-signal and power connections, potentiometric recorders

OPERATION

IMPORTANT

Before placing the recorder in operation for the first time, remove all shipping brackets and tie-down tapes which protect the parts during shipment.

INSTALLING CHART ROLL (See Fig. 6)

To install a new chart roll, perform the following steps:

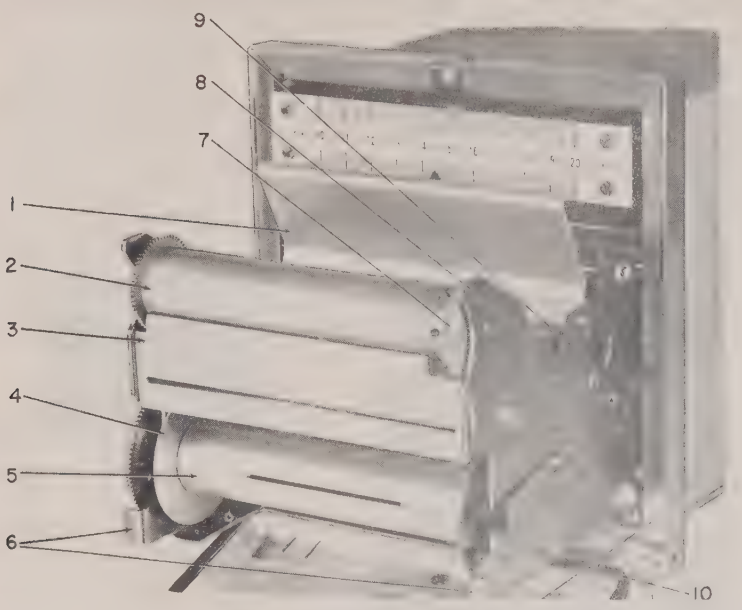
1. Open the front cover by depressing the latch button at the top front edge of the case.

2. Extend the chart carriage (10) as far as it will go by pulling on the two flanged edges of the chart carriage slides (6); then, lift the paper cover (1).

3. Place the chart roll in the chart-paper trough (8) with sprocket holes at the right. Withdraw about ten inches of chart paper and lower the paper cover.

4. Remove the reroll spool (5) by sliding the spool to the right and then pulling out.

5. Tear (or fold) the end of the chart paper to form a "V", and insert the "V" into the slot in the center of the reroll spool (5).



1. Paper cover
2. Timing drum
3. Writing plate
4. Slip clutch
5. Reroll spool
6. Chart-carriage slide flanges
7. Knurled wheel
8. Paper trough
9. Side plate
10. Chart-carriage section

Fig. 6. Installing the chart roll

6. Wind enough turns of chart paper onto the spool to roll up the unrolled paper and replace the spool in the chart carriage.

7. Dress the chart paper over the writing plate (3) and rotate the timing drum (2) by means of the knurled wheel (7), to engage the pins in the sprocket holes.

INKING THE PEN

With the chart carriage extended as shown in Fig. 6, start the ink flowing in the pen as follows:

1. Fill the inkwell through the filling hole in the top of the inkwell.

2. Grasp the plastic inkwell with the thumb and forefinger such that the filling hole is covered.

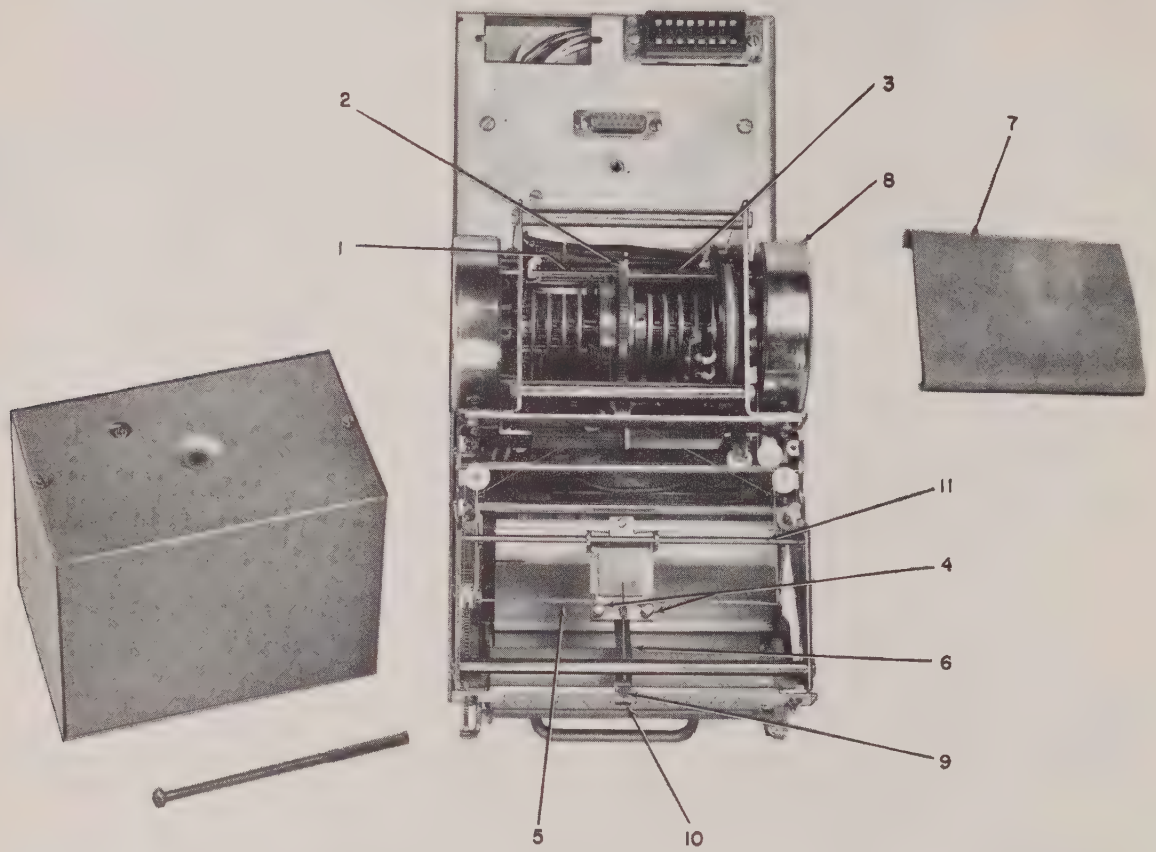
3. Gently squeeze the inkwell until a flow of ink is established at the pen tip.

Used pens, put in operation after prolonged idle periods, may require cleaning. Refer to the Maintenance section for pen-cleaning instructions.

SETTING THE SNAP-ACTION SWITCHES (See Fig. 7)

Snap-action switches (when supplied) provide the recorder with "on-off" control or alarm initiation. Switch-contact current is limited to a maximum of 3.5 amperes for 120-volt non-inductive a-c circuits, 2.5 amperes for 240-volt non-inductive a-c circuits, 3 amperes for 30-volt d-c circuits, and 0.5 amperes for 120-volt d-c circuits.

When the pen pointer is at any scale value lower than the switch operating point, the switch is closed "L" to "C" (NC-common). When the pen pointer is at any



1. Back-set switches
2. Drive-shaft gear
3. Front-set switches
4. Pen-adjust screws
5. Pen-lifter bar
6. Pen-pointer arm
7. Element-assembly cover
8. Control-slidewire cover
9. Set pointer
10. Pen pointer
11. Pen traverse rod

Fig. 7. Parts location, typical recorder

scale value higher than the switch operating point, the switch is closed "H" to "C" (NO-common). Switch positions are identified by number on the applicable wiring diagram in the Alarm or Control-initiation Wiring Diagrams publication in the composite publication shipped with the recorder.

Front-set Switches (3)

1. Place the recorder power switch (8, Fig. 4) in the OFF position.

WARNING

PLACING POWER SWITCH IN OFF POSITION DOES NOT REMOVE CONTROL-INITIATION CIRCUIT VOLTAGES FROM SNAP-ACTION-SWITCH TERMINALS. IF EXTERNAL CONNECTIONS CANNOT BE DE-ENERGIZED AT THE REAR OF THE RECORDER CASE, USE EXTREME CARE WHEN WORKING NEAR SNAP-ACTION-SWITCH TERMINALS.

2. Withdraw the recorder assembly to the extended position and pry off the plastic snap-action-switch cover (7) with a screwdriver.

3. Rotate the element drive-shaft gear (2) until the pen pointer is at the scale position where control or alarm initiation is desired; then rotate the control-slidewire housing (8) to place the set pointer (9) at the same scale point. (The set pointer can be set to coincide with the scale position of the pen pointer, or it can be set up scale or down scale from the pen pointer, if desired.)

4. Hold the drive shaft gear to prevent shaft rotation, and move the appropriate cam by finger tips or with the eraser on the end of a pencil until the cam operates the switch. Listen for the operating "click" or use an ohmmeter to determine the open or closed position.

5. Repeat Steps 3 and 4 for each snap-action switch.

Set-Pointer Adjustment

After the front-set switches have been adjusted as specified in the Front-set Switches section, the set point can be shifted to other scale points by one of the following methods:

1. Rotate the control-slidewire cover (8) until the set pointer (9) indicates the desired operating point on the scale.

2. Some recorders have a knurled knob on the right end of the scale which can be rotated to move the set pointer (9) to the desired scale point. On some recorders the front cover must be lowered to reach the knob; on others the knob extends through a hole in the front cover.

Back-set Switches (1)

1. Place the recorder power switch (8, Fig. 4) in the OFF position. Read the WARNING following Step 1 in the Front-set Switch section, above, before proceeding to Step 2.

2. Manually turn the drive-shaft gear (2) to move the pen-pointer (10) to the scale position where snap-action-switch operation is desired.

3. Hold the drive-shaft gear (2) to prevent shaft rotation and move the appropriate cam until the cam indentation operates the snap-action switch. (Listen for the operating "click" or use an ohmmeter to determine the open and closed positions.)

4. Repeat Steps 2 and 3 for each back-set switch.

INITIAL OPERATION

CAUTION

An input-signal level outside the 0% to 100% range of the recorder (such as occurs during process shut-down conditions or during initial start-up) will cause the unit's element to run against the stop, loading the bearings and shortening the useful life of the element clutch. Prolonged loading could result in serious damage to the clutch and/or element bearings.

During initial system checkout and subsequent operation under the above conditions, the prolonged loading effect must be eliminated by setting the servomotor power ON/OFF switch to the OFF position.

As shipped from the factory, the recorder has been tested and adjusted for optimum performance. The following procedure will insure proper operation of the

recorder after installation has been completed:

1. Check to see that all electrical connections which have been made are complete, tight, and correct according to the connection-wiring diagram.

2. Check to see that all mechanical arrangements (gear changes, etc.) are completed.

3. If the recorder has dual servo response time (optional), select the desired servo response-time (one-second or five-second) by turning the screwdriver adjustment (20, Fig. 4) located on the left-hand side of the chassis. Full counterclockwise rotation gives a one-second response time and full clockwise rotation gives five-second response time.

Amplifier Gain Adjustment

Depending on the recorder response-time selected, the amplifier gain may require adjustment for optimum recorder operation. This adjustment should also be made if the response time is changed. To adjust the gain, proceed as follows:

1. With the recorder operating and the pen pointer positioned at approximately mid-scale, slowly turn the screw-driver gain adjustment (13, Fig. 4) clockwise until the pen oscillates (it will "paint" a wide trace on the chart).

2. Turn the gain adjustment counterclockwise until the oscillation just ceases.

3. Check for pen-pointer oscillation at each end of the scale and readjust the amplifier gain again, if necessary.

NOTE: If the millivolt input-signal range is converted by the user to measure spans greater than 100 millivolts, connect a copper jumper between points "A" and "B" on the amplifier circuit board (see schematic diagram in Fig. 9) to reduce the amplifier gain by a factor of 10; then repeat the above procedure.

DESCRIPTION

The descriptions given in this section are to assist in identifying and locating the basic assemblies used in the recorder. Functional descriptions of these assemblies can be found in the Principles of Operation section.

The recorder consists of the following basic assemblies:

RECORDER ASSEMBLY (See Fig. 4)

The recorder assembly consists of three major sections: the chart-carriage (5), the element (slidewire) assembly (11), and the amplifier (12). Each section is an individual module for easy replacement. The recorder assembly may be partially withdrawn from the case for inspection or adjustment by releasing the latch lever (17) under the chart carriage. All external connections are made at the rear of the case after removal of a cover plate. An accordian-type cable (16) allows withdrawal of the recorder from the case during operation.

Chart Carriage

The chart carriage can be extended from the recorder assembly for chart-roll changing by pulling by its two chart-carriage slide flanges (6, Fig. 6). A pen lifter automatically raises the pen assembly to clear the chart when the chart carriage is extended.

A chart-drive motor drives the timing drum and the reroll spool (2 and 5 in Fig. 6), through appropriate gearing. Gearing and motors for additional chart speeds are available and can be ordered.

The reroll spool is retained by spring tension and can be easily removed.

Element Assembly

This section (11) contains the measuring slidewire (18), the control (or transmitting) slidewire (9), when supplied, and up to eight cam-operated single-pole-double-throw (SPDT) snap-action switches. Both the measuring and control slidewires are driven by the servomotor through appropriate gearing, and a drive shaft which is common to both slidewires. The cams on the drive shaft operate the snap-action switches, if used. A cable sheave on the drive shaft drives the recording pen (and pointer) through a cable-and-pulley system. A similar sheave attached to the control-slidewire housing drives the set-pointer index through a second cable-and-pulley system. Rotating the control-slidewire housing (9) positions the set-pointer index on the scale (see Fig. 10 for drive-cable details).

As many as eight snap-action switches can be mounted in the element assembly; a total of eight "back-set" switches, or four "back-set" and four "front-set" switches (see Fig. 7). "Back-set" switches must be adjusted individually to operate at the desired scale points, and their operating points must be reset individually at new scale points, if desired. "Front-set" switches, once set to operate at selected scale points, can have all of their operating points shifted simultaneously by manual rotation of the control-slidewire housing. "Front-set" switches, however, maintain their preset operating positions with respect to the set-pointer index as the control-slidewire housing is rotated. Snap-action-switch cams have a friction clutch and can be adjusted without special tools.

A screw-driver adjustment (optional) on the left-hand side of the assembly selects one of two response times by changing the gear ratio in the servomotor gear train. Full-scale recorder response times of one-second (by counterclockwise rotation of the adjustment) and five seconds (by clockwise rotation of the adjustment) can be provided.

Amplifier

The servomotor amplifier (12, Fig. 4) is a plug-in section containing a transistor amplifier, a power supply, and, in most cases, a DC to AC mechanical chopper. The plug-in circuit board is easily removed for inspection or servicing.

PRINCIPLES OF OPERATION

Fig. 8 is a functional-block diagram of a typical servo-operated recorder. These recorders are usually separated into two types of recorders according to the measuring circuits: d-c potentiometric and bridge-type.

In the d-c potentiometric recorder, the unknown d-c signal voltage of the primary detector is compared with a reference or known voltage in the measuring circuit. The difference between the signal voltage and the reference voltage is called the "error" voltage, and is converted to an a-c voltage by a chopper, is amplified, and applied to the windings of one phase of the servomotor. The servomotor repositions the slider arm of the slidewire in the measuring circuit so that the reference voltage is made equal to the unknown signal voltage and the error voltage is "nulled" or reduced to zero. This self-balancing action is continuous and begins with the slightest change in primary-detector signal voltage.

The bridge-type recorder is similar in operation to the d-c potentiometric recorder described above, except that the error voltage is produced by an unbalanced

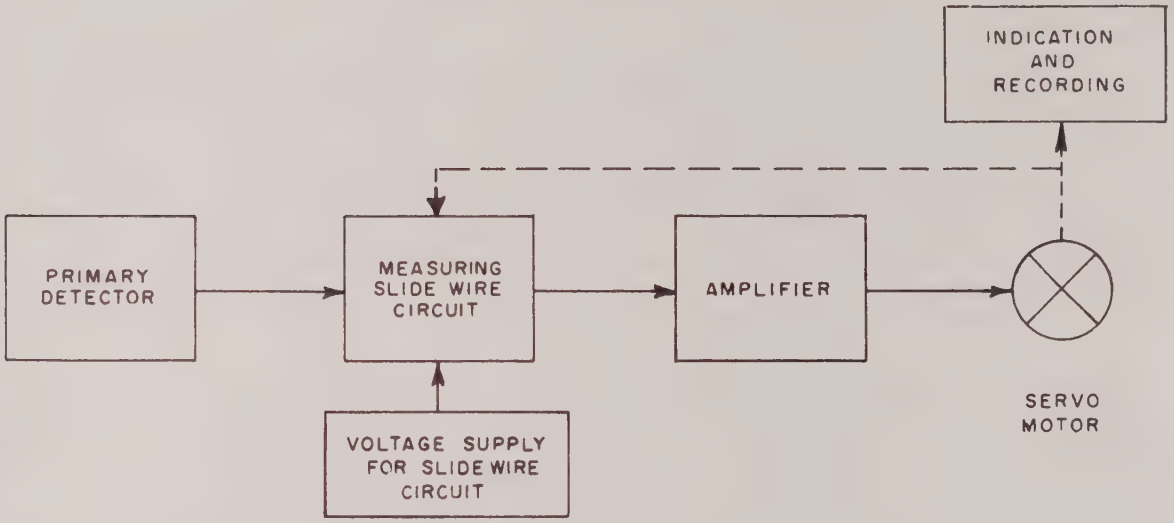


Fig. 8. Functional-block diagram of typical recorder

condition in the Wheatstone Bridge of the measuring circuit. The primary detector constitutes one arm of a Wheatstone Bridge and any change in its resistance will cause a change in voltage across that portion of the bridge. It is this change in voltage (error voltage) which is converted to an a-c signal. The a-c signal is then amplified and used to turn the servomotor, which repositions the slider arm of the measuring slidewires and restores the bridge to a balanced condition.

The recorder may be supplied with other types of measuring circuits for special applications. Refer to the measuring-circuit publication in the composite instructions shipped with the recorder for descriptions of such measuring circuits.

AMPLIFIER

Recorders shipped prior to January 1966 had amplifiers in 3-1/2 inch by 5-3/4 inch by 4-1/2 inch assemblies which were identified only by their group number such as "G700" or G701". These amplifiers complete identities are G-E dwg. No. 1096K40G700 and 1096K40G701.

Recorders shipped after January 1966 are identified by their complete G-E Dwg. number "1095K66" as well as their group number "G700," "G701" etc., and are contained in 2-3/8 inch by 5-3/4 inch by 4-1/2 inch assemblies.

Schematic diagrams for the amplifiers are shown in Fig. 9 and Fig. 9A.

These amplifiers can only be interchanged as indicated in Table IV (Repair Parts Section). After January 1966 only Dwg. No. 1095K66 amplifiers will be shipped from the factory as replacement amplifiers.

Input Filter

The input filter in the d-c amplifier is composed of resistor-capacitor sections which form a low-pass filter. It is used to remove spurious signals which

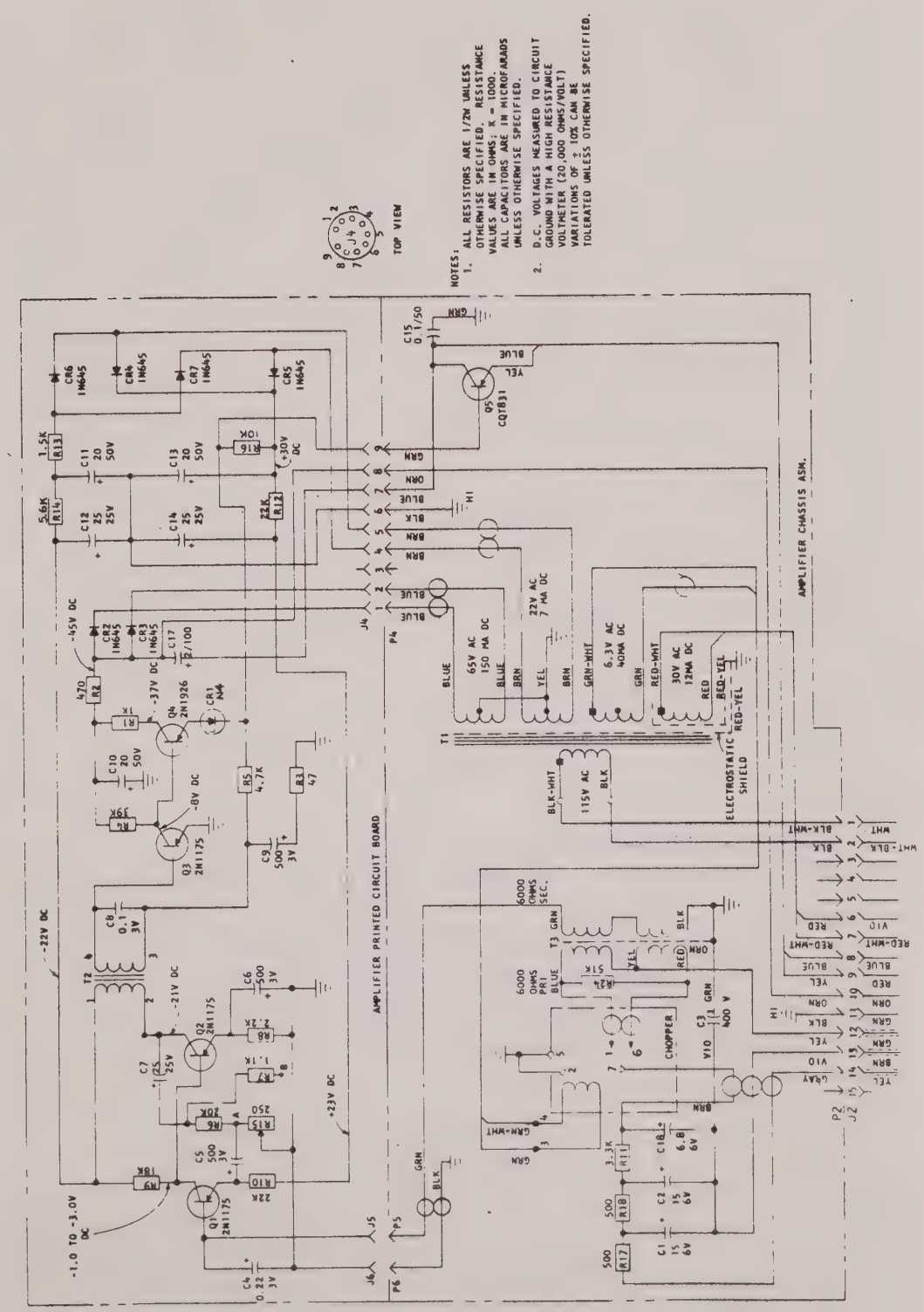


Fig. 9. Schematic diagram, typical amplifier

may be picked up by the thermocouple leads or the leads from the millivolt source which might cause amplifier saturation.

Chopper

The DC to AC chopper consists of a vibrating-reed contactor which is excited by a coil energized at line frequency. The chopper contacts alternately apply the error voltage, at a rate corresponding to the line frequency, to each half of the input-transformer primary. This action produces an alternating flux in the transformer core which induces an alternating voltage proportional to the error signal in the transformer secondary winding.

CONTROL (OR TRANSMITTING) SLIDEWIRE ASSEMBLY (OPTIONAL)

The control-slidewire assembly (when supplied) consists of a 100 percent two-turn control slidewire. The 100 percent proportioning of the slidewire is achieved by a helical construction, thus providing the slidewire with the equivalent of 640 degrees of element-shaft rotation. Since the element shaft can rotate only 320 degrees, the slider on the control slidewire provides control over the entire scale. Rotating the slidewire-housing positions the set-point index on the recorder scale. The control slidewire is provided with mechanical stops that limit set-point index travel to between 2 percent and 98 percent of scale, regardless of pen position. With an external supply-voltage applied to the control-slidewire circuit, an output voltage is obtained which is proportional to the difference between the pen pointer and the set-pointer-index positions on the recorder scale. This voltage provides an operating signal for control-initiating equipment such as the General Electric Type 524 Electric Controllers.

A transmitting-slidewire requires the application of an external supply voltage to operate a remote indicator. Usually, the indicator scale calibration duplicates the recorder scale calibration.

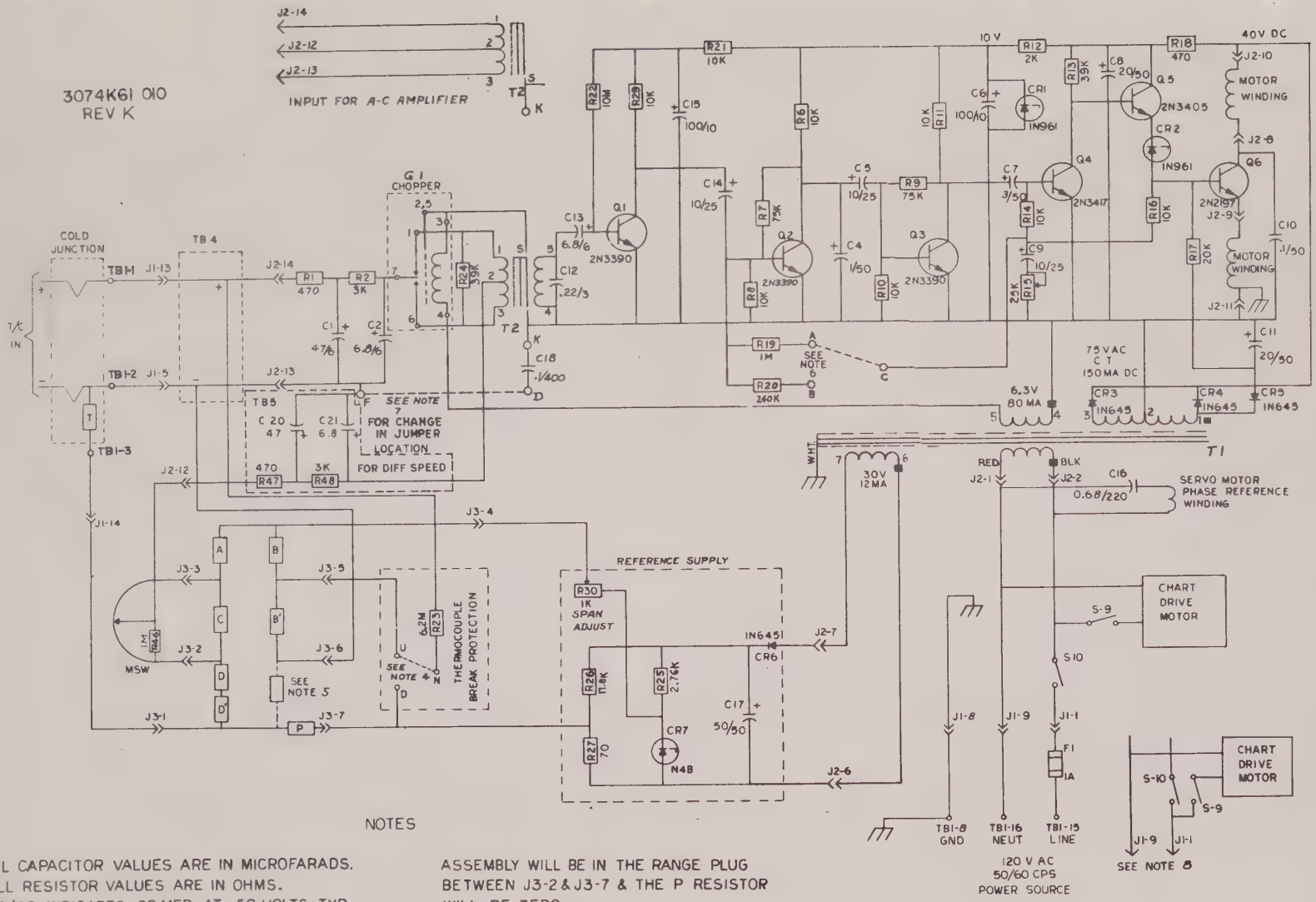
SERVOMOTOR

The servomotor is a two-phase, reversible, induction motor. Two windings for one phase are energized by the power-output stage of the amplifier and are designated as the "control" windings. The windings for the other phase is energized by the a-c line and is designated as the "reference" winding. Rotation is determined by the phase relationship between the current in the reference winding and the current in the control windings. The servomotor rotates the drive shaft which is common to both the measuring slidewire and the control slidewire (if provided). The servomotor circuit is arranged so as to restore balance to the measuring circuit while repositioning the pen pointer on the scale.

MAINTENANCE

REMOVING COVER PLATES

Major sections of the recorder are protected by shield covers which can be removed for inspection, adjustments, or trouble shooting. The element-assembly cover (7, Fig. 7) is removed by carefully prying it from the two shafts on which it is snapped. To remove the amplifier cover, first loosen the centrally located retaining screw and then remove the two cover screws. The amplifier circuit board is a plug-in type and is easily withdrawn for inspection or servicing. The chassis top-plate is secured to the recorder base by four screws.



NOTES

1. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTOR VALUES ARE IN OHMS.
3. 20/50 INDICATES 20 MFD AT 50 VOLTS, TYP.
4. CONNECTION BETWEEN N & U WILL PROVIDE UPSCALE BREAK PROTECTION. FOR DOWNSCALE PROTECTION, CONNECT JUMPER BETWEEN N & D.
5. THE DIAGRAM IS FOR A TEMP RECORDER. WHEN USED AS A MILLIVOLT RECORDER, THE T RESISTOR IN THE COLD JUNCTION COMPENSATOR ASSEMBLY WILL BE IN THE RANGE PLUG BETWEEN J3-2 & J3-7 & THE P RESISTOR WILL BE ZERO.
6. CONNECT "A" TO "C" FOR HIGH GAIN (2.0-50 MV) CONNECT "B" TO "C" FOR LOW GAIN (51-100 MV)
7. JUMPER "D" TO "K" IF INPUT IS GROUNDED.
8. FOR 521: S9 IS CONNECTED AS SHOWN TO BLACK PEN & THE RED PEN SCHEMATIC IS A DUPLICATE LESS CONNECTIONS TO S9 & THE CHART MOTOR.

Fig. 9A. Typical recorder schematic diagram with Dwg. No. 1095K66 amplifier

CHANGING CHART-SPEED GEARS

The recorder is shipped from the factory with the chart speed specified on the order. If a change in chart speed is desired, replacement gears (and chart-drive motors if chart speeds of a different group are desired, see Table I --) can be ordered. Some recorders have been shipped with chart carriages which can use only the motors and gear combinations shown in Table I. Later models have been supplied with chart carriages which can use only the motors and gear combinations shown in Table IA. However, the complete chart carriages (with their applicable motors and gear combinations) can be interchanges between recorders, and only chart carriages which use the components shown in Table IA will be supplied as complete replacement assemblies.

When ordering new gears be sure to specify the chart speed desired, the motor pinion and gears by "T" number or by color and number of teeth, and new chart motor (as necessary) as indicated in either Table I or Table IA, as applicable.

To change the chart speed, proceed as follows:

1. Be sure the power switch (8, Fig. 4) and chart drive switch (6, Fig. 4) are in the OFF position.

2. Extend the recorder assembly from the case (refer to Step 2 of Recorder-assembly Removal), then extend chart carriage.

3. Remove original motor-pinion and idler gear. (Remove chart-drive motor and install new motor if changing chart speeds from one group to another.)

4. Install new gearing. The number of teeth "T" is marked on each gear if Table I gears are used; or use correct colored gears if Table IA is used. Make sure the teeth mesh correctly.

TABLE I

GEARING AND MOTOR SPEEDS FOR VARIOUS CHART SPEEDS

Group No.	Chart Speed (in./hr)	Motor Speed (rpm)	Motor Pinion	Outside Idler Gear	Inside Motor Gear	Reroll Gear
I	1/2	1/30	24T	96T	32T	96T
	1	1/30	40T	80T	32T	96T
	2	1/30	60T	60T	32T	96T
II	4	1/5	30T	90T	32T	96T
	6	1/5	40T	80T	32T	96T
	12	1/5	60T	60T	32T	96T
III	15	1	24T	96T	32T	96T
	30	1	40T	80T	32T	96T
	60	1	60T	60T	32T	96T
IV*	180	1	60T	60T	64T	64T
	360	2	60T	60T	64T	64T
	720	4	60T	60T	64T	64T
	1440	8	60T	60T	64T	64T

* Only motors need be changed in this group to obtain other chart speeds indicated in this group.

TABLE IA

GEARING AND MOTOR SPEEDS FOR VARIOUS CHART SPEEDS

Chart Speed (in./hr.)	Motor Speed (rpm)	GEARS*			
		Motor Pinion (Color and No. of Teeth)	Outside Idler Gear (Color and No. of Teeth)	Inside Idler Gear (Color and No. of Teeth)	Reroll Gear (Color and No. of Teeth)
1/2	1/15	Green - 20	Green - 100	Clear - 25	Clear - 120
1	1/15	Yellow - 24	Yellow - 96	Orange - 30	Orange - 90
2	1/15	Orange - 30	Orange - 90	Red - 40	Red - 80
4	1/15	Orange - 30	Orange - 90	Brown - 60	Brown - 60
6	1/15	Red - 40	Red - 80	Brown - 60	Brown - 60
12	1/15	Brown - 60	Brown - 60	Brown - 60	Brown - 60
15	1/15	Yellow - 24	Yellow - 96	Green - 100	Green - 20
30	4	Green - 20	Green - 100	Clear - 25	Clear - 120
60	4	Yellow - 24	Yellow - 96	Orange- 30	Orange - 90
180	4	Yellow - 24	Yellow - 96	Brown - 60	Brown - 60
360	4	Red - 40	Red - 80	Brown - 60	Brown - 60

*Meshing gears (motor-pinion with inner idler gear, and outer idler gear with reroll) must have the same color and be mounted in the indicated positions to provide the indicated chart speeds.

CLEANING THE PEN

The pen and inkwell, once placed in operation, require little or no attention. If the inkwell is allowed to run dry, the priming operation described under Inking the Pen in the Operation section may not be successful. If the inkwell runs dry and the pen becomes clogged, perform the following steps to clean the pen:

1. Loosen the two screws on the pen clamp (4, Fig. 7) and lift out the pen and clamp assembly.

2. Fill the pen starter (supplied as an accessory) with clean, warm water.

3. Insert the rear of the pen tube into the tip of the pen starter and try to force water through the pen. If a stream of water cannot be forced through the pen, work the small wire cleaner (supplied as an accessory) through the pen tube. Remove the wire cleaner and try again to force water through the pen.

4. Repeat Steps 2 and 3 until a steady stream of water passes through the pen.

5. Empty the water from the pen starter and force air through the pen (by means of the pen starter) to remove any excess water in the pen tube.

CLEANING THE CASE COVER

If the transparent cover becomes dusty or dirty and needs to be cleaned, use a soft cloth moistened with a warm soapy-water solution to wash it; then wipe it dry with a soft cloth. DO NOT use a solvent to clean the cover.

CHANGING THE RECORDER RANGE

If it is desired to change the range of the recorder, order a new range plug, scale, and chart paper through the nearest General Electric sales office. Be sure to include the following information with the order:

1. The complete model number and serial number on the recorder rating plate.

2. The new recorder range desired.

It is recommended that the recorder calibration be checked after a new range plug has been installed. For calibration-checking instructions, refer to the measuring-circuit publication in the composite instructions shipped with the recorder. (Refer to the Note in the Amplifier Gain Adjustment section, also.)

REPLACING THE INKWELL

To install a new inkwell, position the vent and recess nearer the front of the recorder and press the inkwell into its support until it snaps into the holder. It is suggested that the inkwell be cleaned and filled with fresh ink every three months, or more often if required.

CLEANING THE SLIDEWIRES

Contact surfaces of the measuring slidewire (and the control or transmitting slidewires, if used) may require periodic cleaning. The interval between cleaning periods is determined by the environment at the instrument location. An inspection at intervals of four months is recommended. To clean the slidewire, moisten a clean cloth with denatured alcohol and wipe the contact area. Take adequate precautions against fire and the effect of nauseating vapors when using the denatured alcohol. Apply 2 or 3 drops of red Cramolin oil (from vial supplied with accessories) with a toothpick to the wiper-arm surface of the slidewire. Apply the Cramolin sparingly by applying one drop to each end of the slidewire and one drop to the center (apply to trolley-wire in same manner).

INSTALLING PEN ASSEMBLY

If a new pen assembly is to be installed in the recorder, insert the end of the pen tube into the punched hole in the top of the inkwell before clamping the pen assembly by means of the clamp and pen-adjust screws (4, Fig. 7). Align the pen tip with the pen pointer such that they both indicate the same value before tightening the screws.

PEN LIFTER ADJUSTMENT (See Fig. 7)

The pen lifter (5) is spring-loaded to lift the pen vertically. It is factory-adjusted to raise the pen assembly to clear the chart roll when the chart carriage is withdrawn, and to lower it when the carriage is replaced. To adjust the pen lifter, perform the following steps:

1. Extend the chart carriage.

2. Bend left-hand spring stop (the bend at the end of the pen lifter) so that lifter holds pen-pointer arm (6) as high as possible without touching scale.

3. Push chart carriage back into its operating position.

4. Adjust right-hand stop so that pen-lifter bar (5) is approximately 1/32-inch below pen-pointer arm (6).

REPLACING THE DRIVE CABLES

The pen-pointer and set-pointer drive cables require a minimum of maintenance. If inspection reveals that a drive cable is frayed or broken, perform the following steps (in the order given) to replace the cables. Fig. 10 provides a diagram to assist in installing the new cables.

Measuring Slidewire Cable (Pen-pointer)

1. Place both the power switch (8, Fig. 4) and the chart switch (6, Fig. 4) in the OFF position.

2. Remove the measuring-slidewire cover.

3. Rotate element shaft counterclockwise as far as it will go. (Cable clamp on sheave will appear at 12 o'clock position as in detail "X" of Fig. 10.)

4. Loosen element stop and rotate element clockwise (looking into measuring slidewire) as far as it will go; then re-tighten stop.

5. Knot one end of an 18-inch length of new cable and lead it from the rear of recorder first under the element shaft and then into the slot in the sheave. Lead other end of cable over sheave to pulley No. 1 and through the numbered pulley system in clockwise direction. Feed cable through pen-pointer assembly, but do not tighten cable clamp.

6. Feed cable end from pulley No. 4 underneath the element shaft, and then around sheave. Pull cable snug (approximately 6 to 8 ounces of tension) and clamp as shown in detail "X" of Fig. 10.

7. Move pen-pointer assembly upscale as far as possible and tighten the cable clamp.

8. Loosen element stop and rotate element counterclockwise as far as possible; re-tighten stop.

9. Calibrate the recorder as directed in the Specific Information publication covering the recorder measuring circuit. The measuring-circuit publication is included in the composite instruction publication shipped with each recorder.

Control Slidewire Cable (Set-pointer Index)

1. Place the power switch (8, Fig. 4) and the chart switch (6, Fig. 4) in the OFF position.

2. Remove the control-slidewire cover. Remove the sliding contact and the slidewire housing. (Housing is secured by three screws.)

3. Rotate front-set sheave until it is in position shown in detail "Y" of Fig. 10.

4. Knot one end of an 18-inch length of new cable and place it in slot in sheave. Wrap cable clockwise around sheave and then lead it to pulley "A".

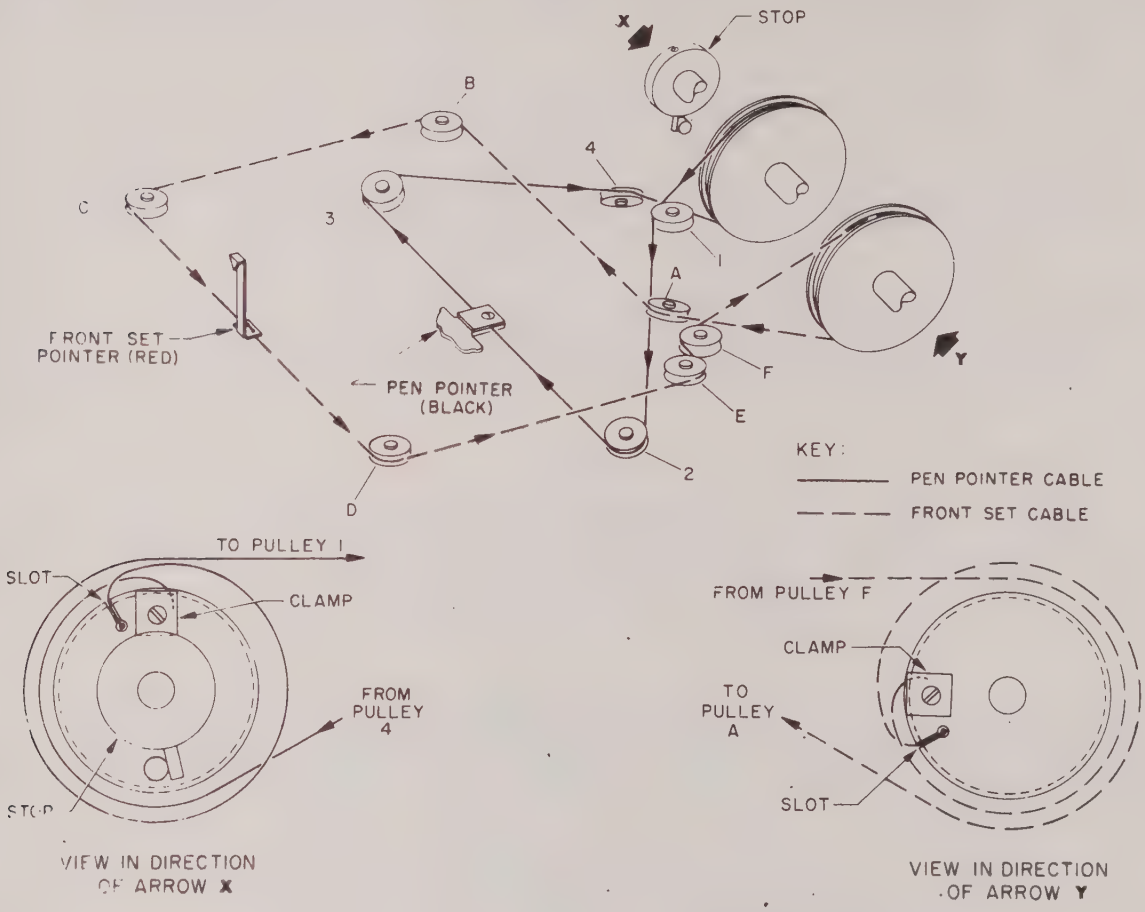


Fig. 10. Drive-cable replacement diagram

5. Feed cable through the lettered pulley system in counterclockwise direction. Lead the cable through set-point pointer, then position the pointer at mid-scale.

6. From pulley "F", wrap cable clockwise around sheave. Pull cable snug (approximately 6 to 8 ounces of tension) and clamp as shown in detail "Y" of Fig. 10.

7. Replace the control slidewire housing. Rotate housing to full left end and full right end of scale. Set-point pointer should stop at 2% and 98% of scale; if it does not, adjust slidewire housing for the 2% to 98% scale sweep by loosening the mounting screws which hold the housing and rotating it for the 2% to 98% sweep. Then, tighten mounting screws.

8. Position the pen-pointer and the set-pointer at mid-scale.

9. Install the sliding contact (removed in Step 2), aligning the brush with the yellow-line marked on the inside of the housing. Manually position the set-pointer at both scale ends while observing that the coiled lead wire on the sliding contact does not bind. Normal brush pressure is 35 grams ±5 grams.

10. Replace the control-slidewire cover.

LUBRICATION

Only the parts specified in Table II require lubrication; all other bearings and moving parts in the recorder are of the self-lubricating type and do not require additional lubrication. "Paint" the lubricant on the appropriate surface using a minimum amount of lubricant. Wipe off excess lubricant.

TABLE II

LUBRICATION

Period	Unit (location)	Lubricant	Amount
6 months	Chart-carriage slides (See Fig. 6)	Squeeze-tube lubricant Cat. No. A5482830P1	Apply small amount with brush

REPAIR AND REPLACEMENT

If a component is to be returned for repair, obtain shipping instructions from the nearest General Electric sales office.

TROUBLE SHOOTING

It is recommended that only a qualified electronic technician be allowed to service or trouble shoot the electronic and electrical parts of the recorder. Trouble shooting will be expedited if the following steps are taken:

1. Determine which of the symptoms in Table III describes the faulty operation of the recorder most accurately.

2. Look for the probable cause and the remedies in the sequence given.

3. Check for correct operation of the recorder after each step in the remedy has been performed.

4. Place the recorder power switch in the OFF position prior to removal of any component and restore power only when repair parts are in place and connections are tight.

POWER FUSE

The recorder power fuse (15, Fig. 4) should be replaced (when necessary) with a fuse of equal rating. Determine and correct (if possible) the cause of fuse blow-out before inserting a new fuse.

WARNING

USE EXTREME CARE WHEN WORKING ON A SECTION WHERE THE COVER HAS BEEN REMOVED. SNAP-ACTION SWITCH TERMINALS MAY NOT BE DE-ENERGIZED EVEN THOUGH THE RECORDER POWER SWITCH IS IN THE OFF POSITION.

TABLE III

TROUBLE SHOOTING

Symptom	Probable Cause and Remedy
I. Pen-pointer does not respond to change in input signal.	A. Loss of A-c Power 1. Check for proper line voltage at terminals 15 and 16 on TB1. 2. Check fuse. Replace, if necessary, after determining cause of blow-out. B. Open or shorted connections 1. Inspect all terminal boards for loose connections and frayed or broken leads. 2. Inspect and test power cable for possible short circuits of the lead-to-lead or lead-to-ground type. C. Faulty measuring slidewire 1. Check contact brush for a pressure of 35 grams ±5 grams. 2. Remove range plug and check slidewire resistance. It should be 2700 ohms; if not, replace slidewire. 3. Check measuring-circuit resistor values. (Values stamped on resistors.) D. Incorrect input-signal Measure d-c input signal at input terminals. If signal is greater than limits specified on rating plate, investigate the signal source. E. Mechanical binding 1. Check drive mechanism by manually rotating the servomotor shaft. The pen-pointer should move freely from one end of the scale to the other. 2. Tighten all set screws in the slidewire sliding-contact. 3. Check the response-time gears.

TABLE III TROUBLE SHOOTING (Cont.)

Symptom	Probable Cause and Remedy
I. (Cont.)	F. Defective reference-voltage source Measure the voltage between terminals J3-4 and J3-7 on the reference board. It should be approximately 7 volts DC. G. Faulty servomotor Measure the voltage between terminals 1 and 4 on the element terminal board (TB-2 behind power switch). It should be approximately 20 volts AC with 120 volts AC between terminals 1 and 2 on TB-3. If not: a. Replace capacitor C16. b. Replace servomotor. H. Defective Amplifier a. Temporarily remove the range plug. b. With power switch in ON position, servomotor should drive pen-pointer off scale. c. Replace the chopper and/or transistor Q5. d. Replace the amplifier.
II. Erratic operation.	A. Excessive amplifier gain. 1. Adjust amplifier gain as described in the OPERATION section. 2. Check input-circuit lead resistance to ground. Measured resistance should be greater than 100 megohms. B. Loose connections. Inspect all terminals for loose connections. C. Defective slidewire. 1. Clean slidewire as described in MAINTENANCE section. (Brush pressure should be 35 grams ±5 grams.)

TABLE III

TROUBLE SHOOTING (Cont.)

Symptom	Probable Cause and Remedy
II. (Cont.)	2. Remove range plug and check slidewire resistance. It should be 2700 ohms; if not, replace slidewire. 3. Check measuring-circuit resistor values. (Values stamped on resistors.) D. Excessive electrical interference. 1. If signal values are greater than the input-signal span on rating plate, it may indicate excessive spurious signals between the input or output leads and ground. Additional filtering (at the input), or special ground leads and shielding may be required. 2. Check for strong a-c magnetic fields at recorder location. E. Defective amplifier a. Temporarily remove the range plug. b. With power switch in ON position, servomotor should drive pen-pointer off scale. c. Replace the chopper and/or transistor Q5. d. Replace the amplifier.
III. Sluggish response and/or excessive deadband.	A. Low amplifier gain Adjust amplifier gain as described in the OPERATION section. B. Faulty servo-driven mechanism With the power switch in OFF position, rotate drive shaft manually to move pen-pointer from one end of the scale to the other. The drive cable and pulley system should operate smoothly without binding.

REPAIR PARTS

Repair parts such as capacitors and transistors should be obtained locally. If they cannot be obtained locally, they can be ordered through the nearest General Electric sales office. When ordering repair parts, identify the parts as completely as possible, giving the complete catalog number, if available, or any other identification such as reference designation on wiring diagrams. Also, include on the order the quantity required and the complete model number of the recorder (from the rating plate inside the case).

RECOMMENDED SPARE PARTS LIST

It is recommended that the recorder user keep the following parts on hand as spares:

Quantity	Item	Cat. No.
1	Cable (Drive)	BTCAB80112
1	Lubricant, tube	A5482830P1
6	Inkwells	4496K60-700
1	Pen	8096K62G700
5	Chart rolls	(Printed on chart roll)
1	Box, fuses	3744K11-035
1	Transistor (Q5)	6847K90-007
1	Chopper	2705K41-006

TABLE IV

AMPLIFIER INTERCHANGEABILITY

(Dwg. No. 1096K40) G700 interchanges with:

0-2 MV input - signal span - Dwg. No. 1095K66 (Special)
0-50 MV input - signal span - Dwg. No. 1095K66 G700*
0-100 MV input - signal span - Dwg. No. 1095K66 G702*

(Dwg. No. 1096K40) G701 interchanges with:

0-101 MV through 0-1.0 Volt input-signal spans - Dwg. No. 1095K66 G706**

Special Conductivity or Humidity recorders require a Dwg. No. 1095K66G704 amplifier.

*Dwg. No. 1095K66G702 amplifiers are similar to Dwg. No. 1095K66G700 amplifiers except that a jumper is connected from point "C" to "B" instead of "C" to "A" on the printer-circuit board (refer to Fig. 9A.)

**Dwg. No. 1095K66G706 amplifiers are similar to Dwg. No. 1095K66G702 amplifiers except that the first stage amplifying components have been eliminated.

INSTRUMENT DEPARTMENT

GENERAL ELECTRIC

WEST LYNN, MASS.

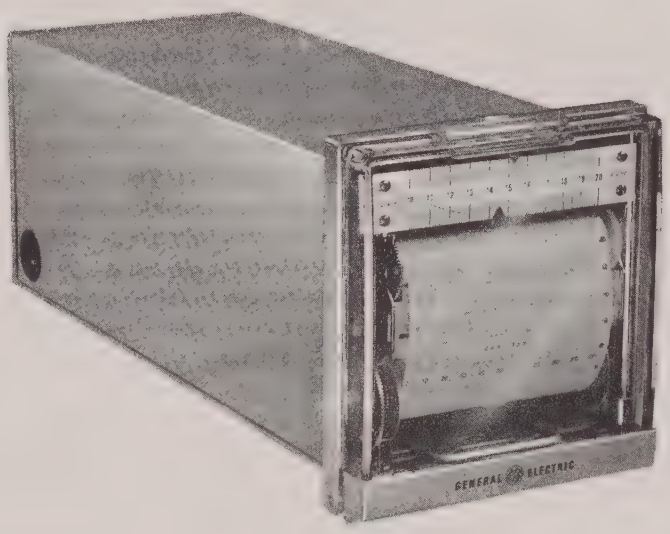
39-100

Printed in U.S.A.

RENEWAL PARTS

198 4530K40-350

TYPE 520, -521, -530, -531
MINIATURE RECORDERS



INTRODUCTION

This publication lists, describes, and illustrates all procurable assemblies for the General Electric Miniature Recorder Types 520, 521, 530, and 531. Sections I through XI contain Group Assembly Parts Lists for the recorder assemblies, and Section XII contains a Numerical Index for all the parts in Sections I - XI.

To identify your assembly, first locate it on the illustrations in this section. Then, refer to the legend at the bottom of the illustrations for the Section(s) in which the assembly is located. If the legend refers you to more than one Section, read the introduction in each referenced Section to properly identify your assembly.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

GENERAL ELECTRIC

GROUP ASSEMBLY PARTS LIST

GENERAL. Each parts list has an associated illustration to portray recorder assembly parts and their relation to one another. In most cases the listings are arranged in the order of disassembly, and are keyed to the illustration by index numbers. Each listing has five columns: Fig. & Index No., Part No., Description, Usage Code, and Units Per Assy.

FIG. & INDEX NO. COLUMN. This column keys a part to an illustration and the applicable index number.

PART NO. COLUMN. This column lists the General Electric part number. For parts that can be purchased directly from manufacturers (vendors), other than General Electric Company, the applicable vendor's number is listed in this column. Vendor parts that have not been assigned a complete part number are identified by the term "No Number".

DESCRIPTION COLUMN. Descriptions of parts are listed adjacent to their part number, and are indented one or more spaces to the right of their respective assemblies in order to show their relationship to that assembly. For vendor parts, the vendor's code is included in parentheses after the part description. General Electric, in most cases, has assigned a specification control number to vendor parts. This number is identified by the symbol "Δ" and is enclosed in parentheses preceding the vendor's code. When ordering a vendor part that is covered by a General Electric specification control number, the description must include this number as well as the vendor's part number. Vendors codes used in this publication are listed in the Vendors' Code table in this section. When a component is held in place by means of attaching parts, the attaching parts are listed immediately following the component they attach and are designated as "Attaching Parts". The symbol "---*---" designates the end of attaching parts and the continuation of the assembly listing.

USAGE CODE COLUMN. Assembly and detail part variations, among the groups covered by this publication, are indicated by number and/or letter symbols in this column. When the column is blank, the component listed is common to all groups.

UNITS PER ASSY COLUMN. The quantities listed in this column are only those needed at the location indicated, and are not necessarily the total quantity used in the complete equipment. For total quantities, reference should be made to the Numerical Index.

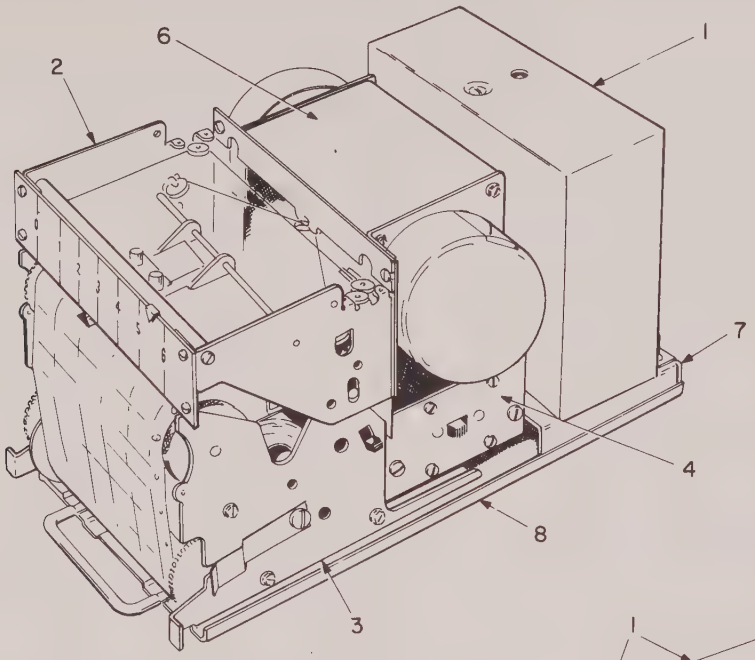
NUMERICAL INDEX

GENERAL. The Numerical Index in Section XII covers all the parts listed in Sections I through XI. The index has three columns: Part No., Fig. & Index No., and Qty per Instrument.

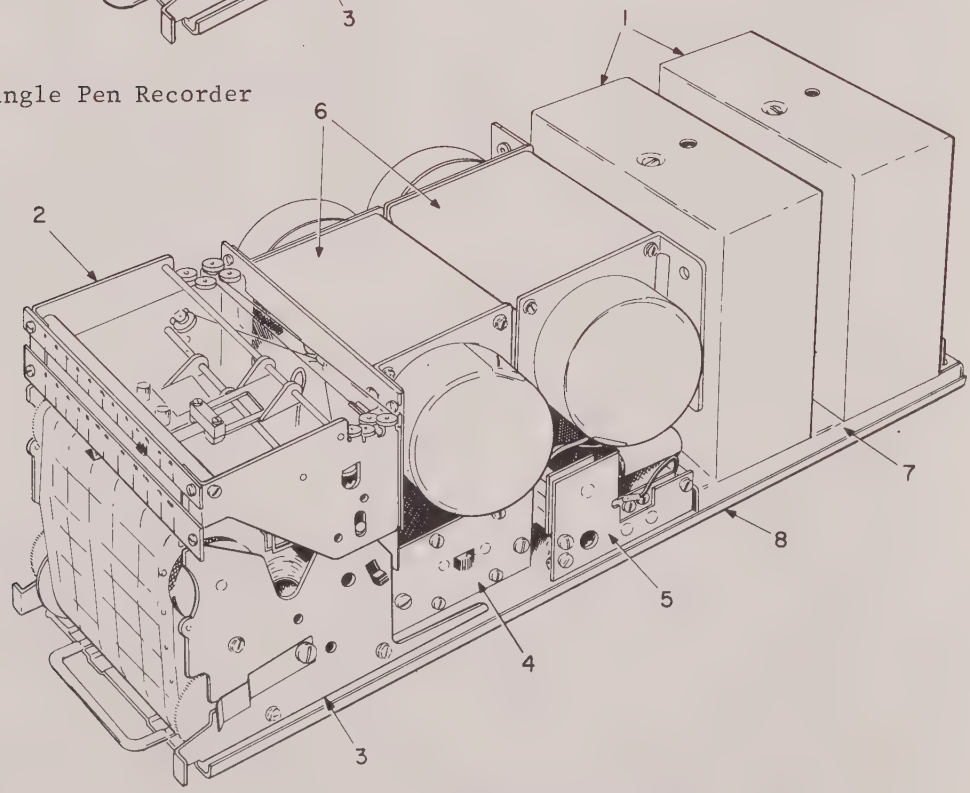
PART NO. COLUMN. This column contains an alpha-numerical listing of replaceable parts of the equipment. Where "No Number" items were listed in the Group Assembly Parts Lists, only the principal noun is listed.

FIG. & INDEX NO. COLUMN. This column keys a part to an illustration and the applicable index number in Sections I through XI. For example, 4-1-40 refers to item 40 of figure 1 in Section IV.

QTY PER INSTRUMENT COLUMN. The quantities listed in this Column are the total quantities required of that part in a complete instrument.



520 and 530 Single Pen Recorder



521 and 531 Dual Pen Recorder

1- Amplifier Assy (See Sect. I or II)
2- Pen Carriage Assy (See Sect. III)
3- Chart Carriage Assy (See Sect. IV or V)
4- Reference Board Assy (See Sect. VI)
5- Bracket Assy (See Sect. VII)
6- Element Assy (See Sect. VIII or IX)
7- Base Plate Assy (See Sect. X)
8- Base Assy (See Sect. X)

VENDORS CODE

V01121	Allen-Bradley Co. Milwaukee, Wis.
V01295	Texas Instruments, Inc. Semi-Conductor-Components Div. Dallas, Texas
V02660	Amphenol-Borg Electronics Corp. Chicago, Illinois
V03508	General Electric Co. Semi-Conductor Prod.Dept.GECO Syracuse, N.Y.
V04713	Motorola, Inc. Semi-conductor Prod.Div. Phoenix, Arizona
V05009	Sealectro Corp. Mamaroneck, N.Y.
V05581	A.G.I. Rubber Co. Bridgeport, Conn.
V06001	General Electric Co. Capacitor Dept. Irmo, South Carolina
V06486	North American Electronics,Inc. Lynn, Mass.
V07910	Continental Device Corp. Hawthorne, Calif.
V08530	Reliance Mica Corp. New York, N.Y.
V11236	CTS of Berne, Inc. Berne, Ind.
V12697	Clarostat Mfg.Co.,Inc. Dover, N.H.
V15909	Daven Co. Division of Thomas A. Edison Industries Livingston, N.J.
V19420	Merrimac Magnetics Corp. Lowell, Mass.
V56289	Sprague Electric Co. North Adams, Mass.
V71785	Cinch Mfg. Co. Chicago, Ill.
V74970	E.F. Johnson Co. Waseca, Minn.
V78189	Shakeproof Div. of Illinois Tool Works Elgin, Ill.
V78488	Stackpole Carbon Co. St. Marys, Pa.
V78584	Stuart Stamping Co. Yonkers, N.Y.
V79136	Waldes Kohinoor, Inc. Long Island City, N.Y.
V81541	Airpax Electronics Inc. Cambridge, Maryland
V83259	Parker Seal Co. Culver City, Calif.
V91146	ITT Cannon Electric, Inc. Salem Division Salem, Mass.
V91265	Goshen Rubber Co., Inc. Goshen, Indiana
V91504	Atlas Engineering Co.,Inc. Roxbury, Mass.
V91929	Minneapolis-Honeywell Regulator Co. Micro-Switch Division Freeport, Ill.
V95354	Methode Manufacturing Co. Chicago, Ill.
V96768	C.E.M. Company Danielson, Conn.
V98925	Semi-Conductor Division of Clevite Corp. Waltham, Mass.
V98350	Daystrom Pacific Division of Daystrom Inc. Los Angeles, Calif.

SECTION 1
AMPLIFIER ASSEMBLY
P/N 1095K66

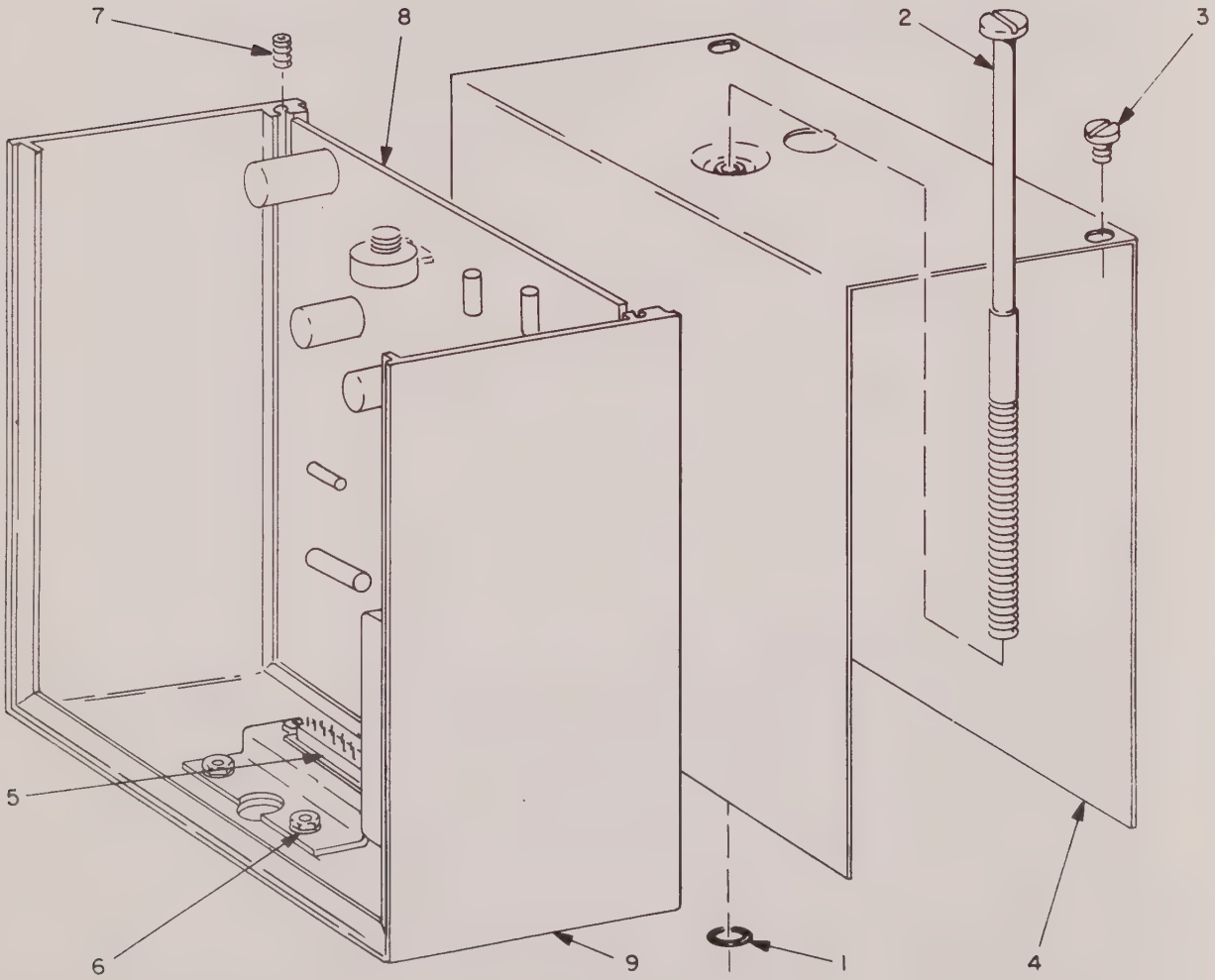


Figure 1-1. Amplifier Assembly, P/N 1095K66

This section contains a Group Assembly Parts List for Amplifier Assembly 1095K66, groups G701 thru G704, and G706. The group number of your particular amplifier is stamped on its cover. This amplifier assembly has overall dimensions of 5-9/16 in. wide x 4-5/8 in. high x 2-3/8 in. deep.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code column, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability List

1095K66	No. (→ Letter)	A	B	C	D	E	F	G	H	J	K
G700	1	X		X	X			X	X	X	X
G701	2		X			X	X	X	X	X	
G702	3	X		X	X			X		X	X
G703	4		X			X	X	X			
G704	5			X		X			X		X
G706	6				X		X	X	X	X	X

PARTS LIST

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1-1-	1095K66	AMPLIFIER ASSEMBLY		Ref
		(Attaching Parts)		
-1	6311K12P022	. PACKING, "O" ring.		1
-2	NBZAM17074	. SCREW, Slotted pan hd, steel-cad/ iridite, No. 10-24 x 4 5/8 in.lg. .		1
		---*---		
-3	NBZME13004	. SCREW, Slotted pan hd, brass, 0.0002 in. ni plated, No. 6-32 by ¼ in.lg		2
-4	2827K41G701	. COVER.		1
-5	No Number	. BRACKET ASSEMBLY		1
		(Attaching Parts)		
-6	NBSME09004	. SCREW, Slotted flat hd, brass,0.0002 in. ni plated, No. 4-40 by ¼ in.lg.		2
	NTMPE11000	. LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in. ni plated, No. 4		2
	NLNME09	. NUT, Square, brass, 0.0002 in. ni plated No. 3/32		2
		---*---		

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1-1--	1696K70P001	. . BRACKET		1
--	DA15P	. . CONNECTOR, Male, 15 contacts, (△5730K90P003) (V91146)		1
		(Attaching Parts)		
--	NBZME09004	. . SCREW, Slotted pan hd, brass, 0.0002 in.ni plated, No. 4-40 by ¼ in. lg		2
--	NTMPE11000	. . LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in. ni plated, No. 4.		1
--	2104-04-00	. . TERMINAL, Locking (△8311K42001) (V78189)		1
--	NLMNE09000	. . NUT, Hex hd, brass, 0.0002 in. ni plated, No. 4-40		2
		---*---		
-7	NKLME13003	. SCREW, Set, hex socket, flat point, brass, ni plated, No. 6-32 by 3/16 in. lg		2
-8	1589K80G700	. PRINTED CIRCUIT BOARD ASSEMBLY . . . . (See figure 1-2)	A	1
	1589K80G701	. PRINTED CIRCUIT BOARD ASSEMBLY . . . . (See figure 1-2)	2	1
	1589K80G702	. PRINTED CIRCUIT BOARD ASSEMBLY . . . . (See figure 1-2)	4	1
	1589K80G703	. PRINTED CIRCUIT BOARD ASSEMBLY . . . . (See figure 1-2)	5	1
	1589K80G705	. PRINTED CIRCUIT BOARD ASSEMBLY . . . . (See figure 1-2)	6	1
-9	2166K68P001	. CASE		1
1-2-	1589K80	PRINTED CIRCUIT BOARD ASSEMBLY (See item 8, figure 1-1)		Ref
-1	EB-7535	. RESISTOR, Insulated, fixed composition, 75K ohms + 5%, ½ w (△6143K12P141) (V01121) (R7,R9). .		2
-2	2N3390	. TRANSISTOR, NPN, Silicon, low power (△6854K90P060) (V03508) (Q1,Q2,Q3)	C	3
	2N3390	. TRANSISTOR, NPN, Silicon, low power (△6854K90P060) (V03508) (Q2, Q3) .	F	2
-3	EB-1035	. RESISTOR, Insulated, fixed composition, 10K ohms ± 5%, ½w (△6143K12P109) (V01121) (R6, R8, R10, R11, R14, R16, R21, R29) . . .	C	8
	EB-1035	. RESISTOR, Insulated, fixed composition, 10K ohms ± 5%, ½ w (△6143K12P109) (V01121) (R5, R6, R8, R10, R11, R14, R16)	B	7
	EB-1035	. RESISTOR, Insulated, fixed composition, 10K ohms ± 5%, ½ w (△6143K12P109) (V01121) (R6, R8, R10, R11, R14, R16)	6	6

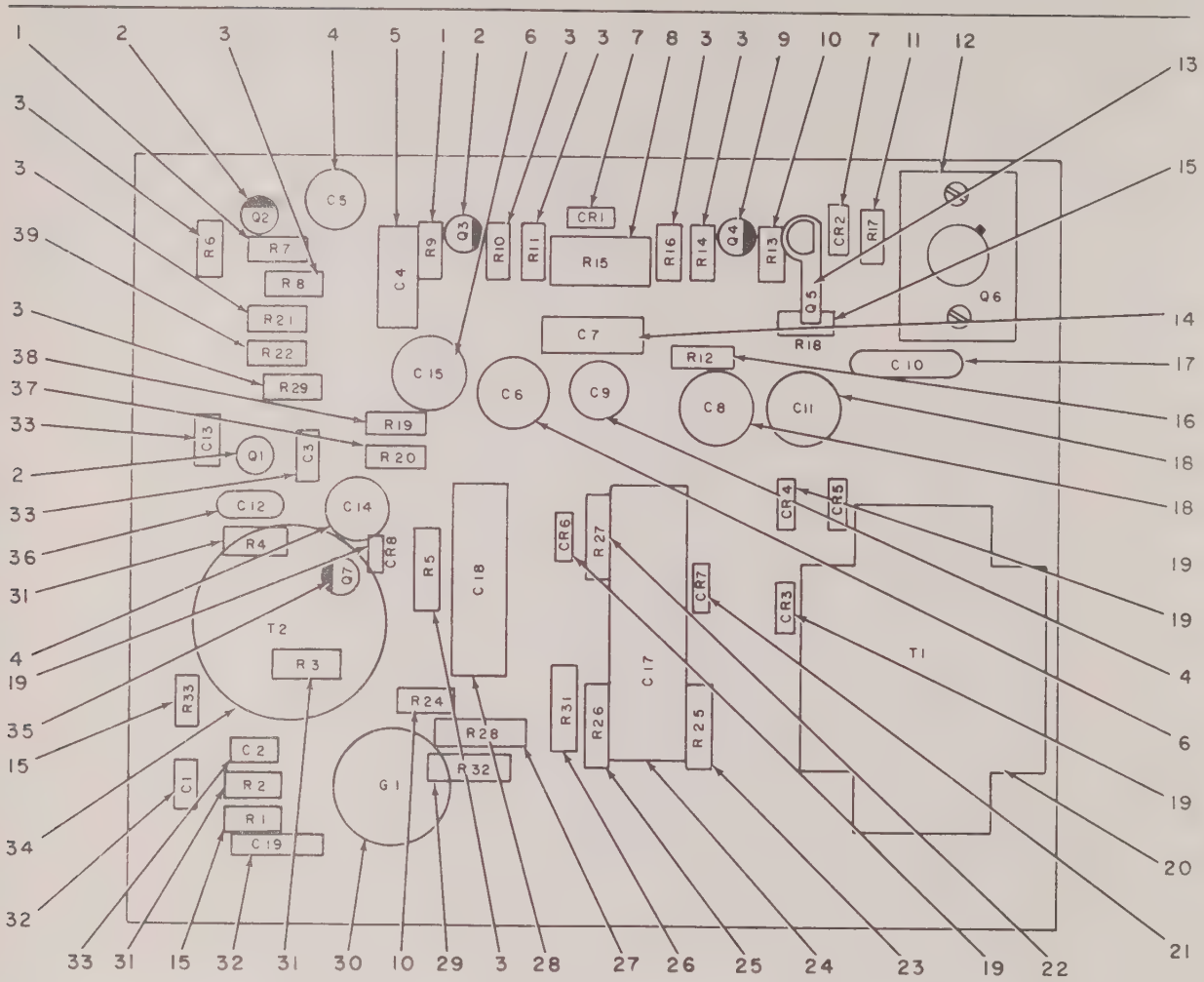


Figure 1-2. Printed Circuit Board Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1-2-4	30D-10mfd	. CAPACITOR, Electrolytic, dc, aluminum, 10 mfd -20 +75%,50 VDC (△2098K60P004) (V56289) (C5,C9,C14)	C	3
	30D-10mfd	. CAPACITOR, Electrolytic, dc, aluminum, 10 mfd -20 +75%,50 VDC (△2098K60P004) (V56289) (C5, C9) .	F	2
-5	30D-1mfd	. CAPACITOR, Electrolytic, dc, aluminum, 1 mfd -10 +75%, 50 VDC (△2098K92P137) (V56289) (C4,). . .		1
-6	30D-100 mfd	. CAPACITOR, Electrolytic, dc, aluminum, 100 mfd -20 +75%, 12 VDC (△2098K60P016) (V56289) (C6, C15).	C	2
	30D-100 mfd	. CAPACITOR, Electrolytic, dc, aluminum, 100 mfd -20 +75%, 12 VDC (△2098K60P016) (V56289) (C6,). . .	B	1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1-2-7	IN961	. DIODE, Breakdown, 10 V ± 20% . . . . . (△6707K10P134) (V04713) (CR1,CR2).		2
-8	44	. POTENTIOMETER, Printed circuit composition, 25K ohms, ± 20%, 0.2 w (△5839K45P101) (V12697) (R15). . .		1
-9	2N3417	. TRANSISTOR, NPN, Silicon, low power (△6854K90P052) (V03508) (Q4) . . .		1
-10	EB-3935	. RESISTOR, Insulated, fixed composition, 39K ohms ± 5%, ½ w (△6143K12P130) (V01121) (R13,R24).	D	2
	EB-3935	. RESISTOR, Insulated, fixed composition, 39K ohms ± 5%, ½ w (△6143K12P130) (V01121) (R13). . .	E	1
-11	EB-2035	. RESISTOR, Insulated, fixed composition, 20K ohms ± 5%, ½ w (△6143K12P120) (V01121) (R17). . .		1
-12	7640K61P001	. HEAT SINK.		1
	2N2197	. TRANSISTOR, NPN, Silicon, power (△6856K90P013) (V03508) (Q6) . . . (Attaching Parts)		1
	NGNAC09004	. SCREW, Fill. hd, steel, cad. plated, No. 4-24 by ¼ in. lg. . . . . ---*---		2
-13	2N3405	. TRANSISTOR, NPN, Silicon, low power (△6854K90P059) (V03508) (Q5) . . .		1
-14	30D-3 mfd.	. CAPACITOR, Electrolytic, dc, aluminum, 3 mfd - 10 +75%, 50 VDC (△2098K92P139) (V56289) (C7) . . .		1
-15	EB-4715	. RESISTOR, Insulated, fixed composition, 470 ohms ± 5%, ½ w (△6143K12P061) (V01121) (R1, R18, R33).	4	3
	EB-4715	. RESISTOR, Insulated, fixed composition, 470 ohms ± 5%, ½ w (△6143K12P061) (V01121) (R1,R18) .	J	2
	EB-4715	. RESISTOR, Insulated, fixed composition, 470 ohms ± 5%, ½ w (△6143K12P061) (V01121) (R18). . .	5	1
-16	EB-2025	. RESISTOR, Insulated, fixed composition, 2K ohms ± 5%, ½ w (△6143K12P084) (V01121) (R12). . .		1
-17	33C41	. CAPACITOR, Ceramic, 0.1 mfd + 80-20%, 50 VDC (△2092K90P075) (V56289)(C10)		1
-18	30D-20 mfd	. CAPACITOR, Electrolytic, aluminum 20 mfd-20 +75%, 50 VDC (△2098K60P002) (V56289) (C8,C11) .		2
-19	IN645	. DIODE, Silicone,(△6705K90P010)(V01295) (CR3, CR4, CR5)	K	3
	IN645	. DIODE, Silicone,(△6705K90P010)(V01295) (CR3, CR4, CR5, CR6, CR8)	B	5
-20	MMC-1854	. TRANSFORMER, Power (△8600K62P006) (V19420) (T1)		1
-21	N4-B	. DIODE, Breakdown, 8.4V ± 0.4V (△6707K60P010) (V06486) (CR7). . .	B	1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1-2-38	EB-5155	. RESISTOR, Insulated, fixed composition, 5.1 megohms ± 5%, ½ w (△6143K12P207) (V01121) (R19).	B	1
-39	EB-1065	. RESISTOR, Insulated, fixed composition, 10 megohms ± 5%, ½ w (△6143K12P217) (V01121) (R22).	C	1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
1-2-22	R1375-70	. RESISTOR, Wire wound, 70 ohms ± 0.1%, (△6148K60P001) (V DAVEN) (R27) . .	F	1
-23	R1375-2700	. RESISTOR, Wire wound, 2700 ohms ± 0.1%, (△6148K60P002) (V DAVEN) (R25) . .	B	1
-24	30D-50 mfd	. CAPACITOR, Electrolytic, dc, aluminum, 50 mfd, - 10 +75%, 50 VDC (△2098K92P151) (V56289) (C17) . .	B	1
-25	R1391	. RESISTOR, Wire wound, 18K ohms ± 0.1%. (△6148K60P003) (V DAVEN) (R26) . .	B	1
-26	R1375-3308.34	. RESISTOR, Wire wound,500 ohms ± 0.1% (△6148K60P079) (V DAVEN) (R31) . .	B	1
-27	R1375-500	. RESISTOR, Wire wound, 3308.34 ohms ± 0.1% (△6148K60P198) (V DAVEN) (R28)	B	1
-28	2108K97P445	. CAPACITOR, Film, 0.1 mfd ± 10%,400 VDC (C18)	G	1
-29	R1375-91.680	. RESISTOR, Wire wound, 91.680 ohms ± 0.1% (△6148K60P197)(V DAVEN)(R32).	B	1
-30	2406-011	. CONVERTER, 7 pin (△2705K41P011) (V81541) (G1)	D	1
	111-51-01-062	. SOCKET, 7 pin (△7762K92P063)(V71785).	D	1
-31	EB-3025	. RESISTOR, Insulated, fixed composition, 3K ohms ± 5%, ½ w (△6143K12P090) (V01121) (R2)	D	1
	EB-3025	. RESISTOR, Insulated, fixed composition, 3K ohms ± 5%, ½ w (△6143K12P090) (V01121) (R2, R3, R4)	B	3
-32	150D-47 mfd.	. CAPACITOR, Electrolytic (insulated), solid tantalum, 47 mfd ± 10%, 6 VDC (△2106K92P073) (V56289) (C1) . . .	J	1
	150D-47 mfd	. CAPACITOR, Electrolytic (insulated), solid tantalum, 47 mfd ± 10%, 6 VDC (△2106K92P073) (V56289) (C1, C19).	4	2
-33	150D685X9006A2.	CAPACITOR, Electrolytic (insulated), solid tantalum, 6.8 mfd ± 10%,6 VDC (△2106K40P239) (V56289) (C2, C3) .	B	2
	150D685X9006A2.	CAPACITOR, Electrolytic (insulated), solid tantalum, 6.8 mfd ± 10%,6 VDC (△2106K40P239) (V56289) (C2, C13).	D	2
	150D685X9006A2.	CAPACITOR, Electrolytic (insulated), solid tantalum, 6.8 mfd ± 10%,6 VDC (△2106K40P239) (V56289) (C13). . .	5	1
-34	MMC-1875	. TRANSFORMER, Input (△8600K68P003) (V19420) (T2)	K	1
-35	2N2714	. TRANSISTOR, NPN, Silicon, lowpower (△65854K90P036) (V03508) (Q7). . .	B	1
-36	40C322	. CAPACITOR, Ceramic, .22 mfd +80 -20%, 3 VDC (△2092K60P021)(V56289)(C12).	K	1
-37	EB-2445	. RESISTOR, Insulated, fixed composition, 240 K ohms ± 5%, ½ w (△6143K12P159) (V01121) (R20).	H	1
-38	EB-1055	. RESISTOR, Insulated,fixed composition, 1.0 megohms ± 5%, ½ w (△6143K12P181) (V01121) (R19).	K	1

SECTION II
AMPLIFIER ASSEMBLY
P/N 1096K40

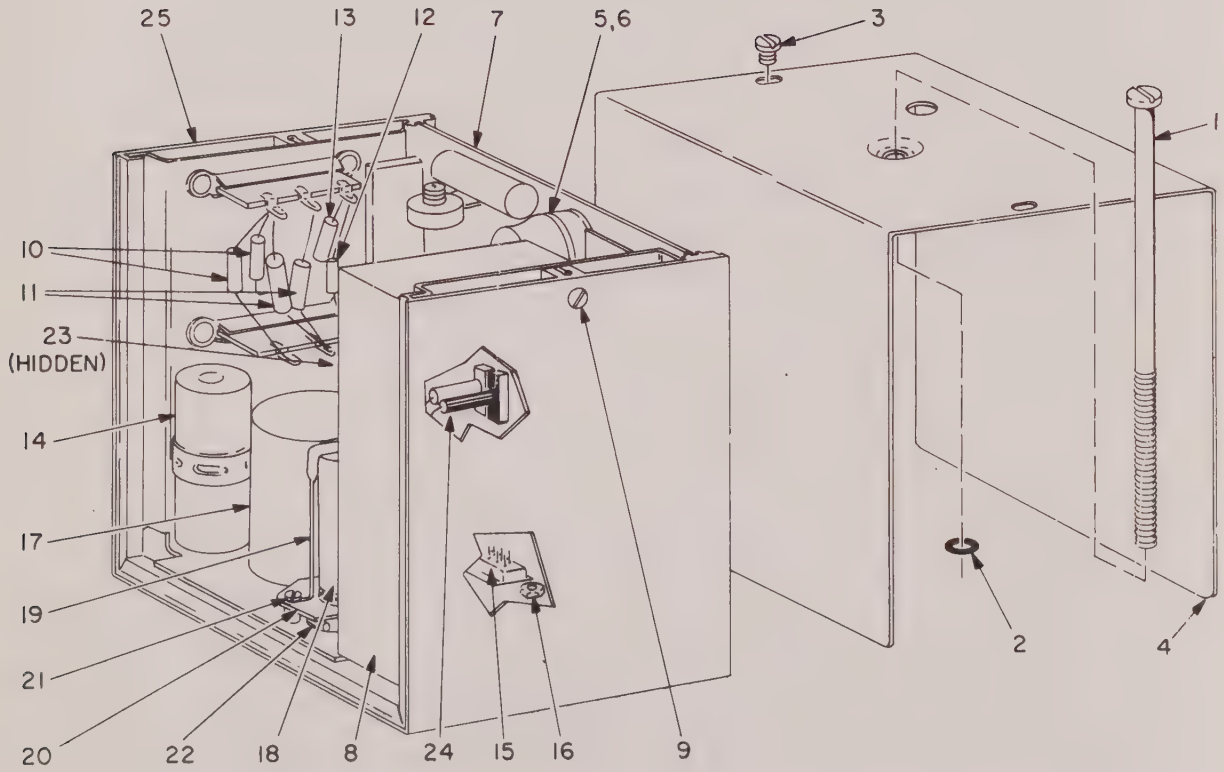


Figure 2-1. Amplifier Assembly P/N 1096K40

This section contains a Group Assembly Parts List for Amplifier Assembly 1096K40, Groups G700 and G701. The group number of your particular amplifier is stamped on its case. This amplifier assembly has overall dimensions of 5-9/16 in. wide x 4-5/8 in. high x 3-1/2 in. deep.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code column, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability List

1096K40	A	B
G700	X	
G701		X

PARTS LIST

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
2-1-	1096K40	AMPLIFIER ASSEMBLY		Ref
		(Attaching Parts)		
-1	NBZME17074	. SCREW, Slotted pan hd, 0.0002 in. ni plated, No. 10-24 by 4 5/8 in. lg .		1
-2	5427-3	. PACKING, "O" ring (△6311K12P022) (V83259).		1
		---*---		
-3	NBZME13004	. SCREW, Slotted pan hd, 0.0002 in. ni plated, No. 6-32 by ¼ in. lg. . . .		2
-4	2827K41G700	. COVER ASSEMBLY		1
-5	2049K42P001	. CAP.		1
-6	M-860	. PLUG, Connector, 9 pin (△5730K61P002) (V95354).		1
-7	1597K42G700	. PRINTED CIRCUIT BOARD ASSEMBLY (See figure 2-2).	A	1
	1597K42G701	. PRINTED CIRCUIT BOARD ASSEMBLY (See figure 2-2).	B	1
-8	7639K40G700	. HEAT SINK ASSEMBLY (See figure 2-3).		1
		(Attaching Parts)		
-9	NBSME09008	. SCREW, Slotted, flat hd, No. 4-40 by ½ lg.		1
		---*---		
--	2289K41G700	. CHASIS ASSEMBLY.		1
		(Attaching Parts)		
--	NBSME09008	. SCREW, Slotted, flat hd, 0.0002 in. ni plated,No. 4-40 by ½ lg		1
--	NBSME09004	. SCREW, Slotted, flat hd, 0.0002 in. ni plated,No. 4-40 by ¼ lg		2
		---*---		

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
2-1-10	EB-5115	. RESISTOR, Insulated, fixed composition, 510 ohms ± 5%, ½ w (△6143K12P063) (V01121) (R17, R18)		2
-11	150D-15 mfd	. CAPACITOR, Electrolytic, solid tantalum, 15 mfd ± 10%, 20 VDC (△2106K40P343) (V56289) (C1, C2)		2
-12	150D685X9006A2	. CAPACITOR, Electrolytic, solid tantalum, 6.8 mfd ± 10%, 6 VDC (△2106K40P239) (V56289) (C18).		1
-13	EB-3325	. RESISTOR, Insulated, fixed composition, 3300 ohms ± 5%, ½ w (△6143K12P091) (V01121) (R11).		1
-14	118P10594S13	. CAPACITOR, Metallized paper, 1.0 mfd ± 10%, 400 VDC (△2095K90P128)(V56289) (C3).		1
		(Attaching Parts)		
--	NBZME09004	. SCREW, Slotted, pan hd, brass, 0.0002 in. ni plated, No. 4-40 by ¼ in lg.		1
--	NTMPE11000	. LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in. ni plated,No.4 .		1
		---*---		
-15	5730K90P003	. PLUG, Connector, 15 pins		1
		(Attaching Parts)		
-16	NBZME09004	. SCREW, Slotted, pan hd, brass,0.0002 in. ni plated,No. 4-40 by ¼ in. lg. . .		2
	NTMPE11000	. LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated, No.4 .		2
	2106-04-00	. TERMINAL, Locking (△8311K178003) (V78189).		1
	926	. TERMINAL, (△8317K60P001) (V78584) . .		1
	NLMNE09	. NUT, Hex, brass, 0.0002 in.ni plated, No. 4-40.		2
		---*---		
-17	8615K60G700	. TRANSFORMER ASSEMBLY (T3).		1
		(Attaching Parts)		
	5424K15P005	. NUT, Hex		1
		---*---		
	105-771	. . PLUG,Jack,straight tip(△5734K60P011) (V74970)		1
	AE7929	. . TRANSFORMER, Audio (△8611K40P001) (V91504)		1
-18	2406-011	. CONVERTER, 7 pin (△2705K41P011) (V81541).		1
-19	2341K65P001	. CLAMP.		1
-20	5700K64G700	. PLATE ASSEMBLY		1
		(Attaching Parts for items 19 and 20)		
-21	NBZME13003	. SCREW, Slotted, pan hd, brass,0.0002 in. ni plated, No. 6-32 by 3/16 in.lg .		4
	NTMPE13000	. LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in. ni plated,No. 6.		4
	2106-06-00	. TERMINAL, Locking (△8311K17P006) (V78189).		1
		---*---		

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
2-1-22	EB-5135	. RESISTOR, Insulated, fixed composition, 57K ohms ± 5%, ½ w (△6143K12P135) (V01121) (R24).		1
-23	614	. GROMMET, Silicone rubber(△4029K10P013) (V91265)		1
-24	4945K60G700	. LEAD AND TERMINAL ASSEMBLY		2
-25	2166K42P001	. CASE		1

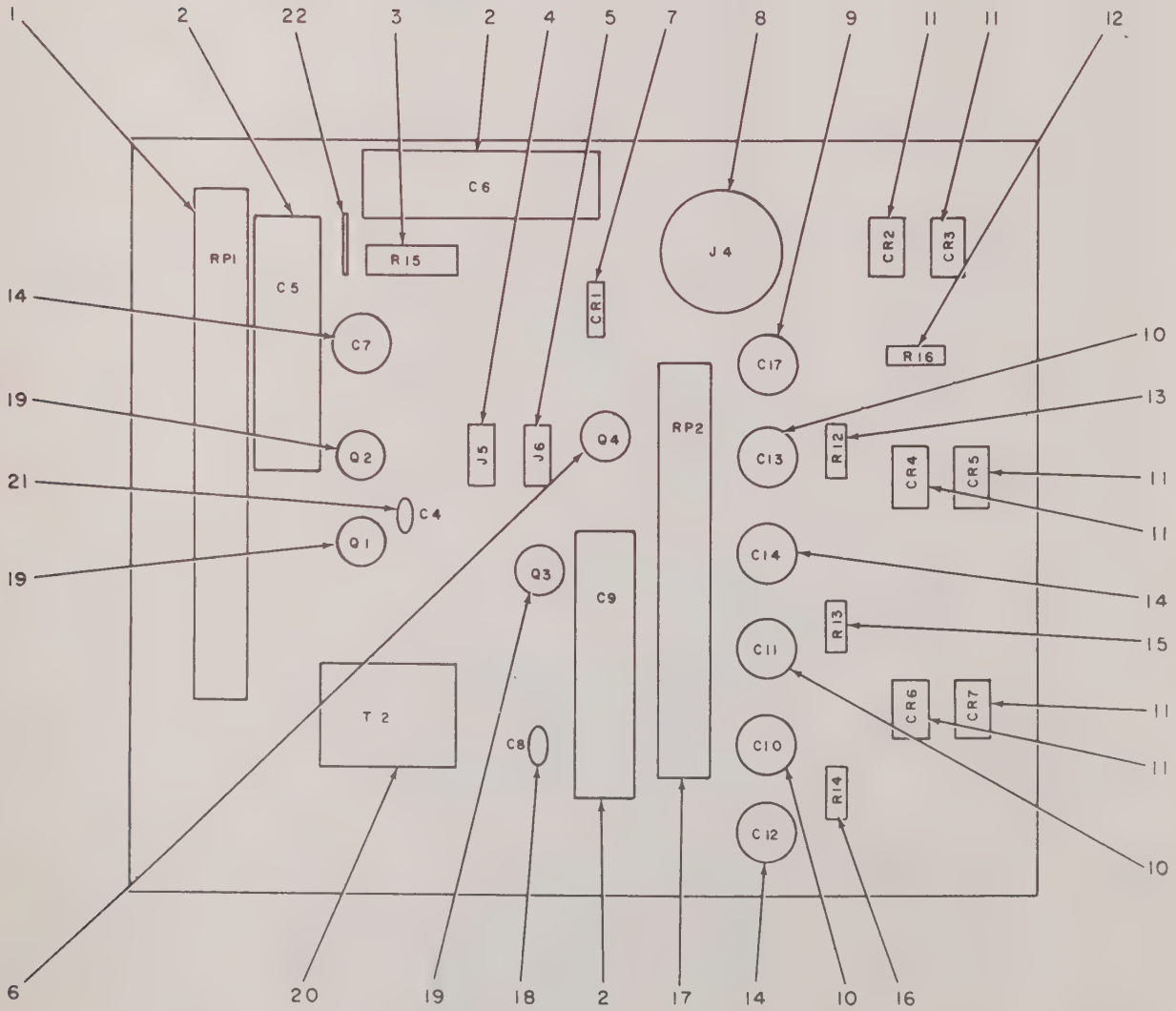


Figure 2-2. Printed Circuit Board Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
2-2-	1597K42G701	PRINTED CIRCUIT BOARD ASSEMBLY (See figure 2-1)		Ref
-1	6143K60P011	. RESISTOR, Composition, module (RP 1 consisting of R6,R7,R8,R9,R10). . .		1
-2	30D-500 mfd.	. CAPACITOR, Electrolytic, dc, aluminum, 500 mfd - 10 + 75%, 3 VDC (△2098K92P029)(V56289)(C5,C6,C9) .		3
-3	44-250 ohms	. POTENTIOMETER, Printed circuit composition, 250 ohms ± 20%, 0.2 w (△5839K45P001)(V12697)(R15). . . .		1
-4	4643K40P052	. JACK, (J5)		1
-5	4643K40P041	. JACK, (J6)		1
-6	2N1926	. TRANSISTOR, PNP, Germanium,low power, (△6845K90P018)(V03508)(Q4)		1
-7	N4	. DIODE, Breakdown, 8.4V ± 0.4V (△6707K60P011)(V06486)(CR1). . . .		1
-8	121-51-00-040	. SOCKET, 9 pin (△7762K93P062)(V71785) (J4).		1
-9	30D-2 mfd	. CAPACITOR, Electrolytic, dc, aluminum, 2 mfd - 20 + 75%, 100 VDC (△2098K60P011)(V56289)(C17). . . .		1
-10	30D-20 mfd	. CAPACITOR, Electrolytic, dc, aluminum, 20 mfd-20 + 75%, 50 VDC (△2098K60P002)(V56289)(C10,C11,C17)		3
-11	IN645	. DIODE, Silicon, (△6705K90P010)(V03508) (CR2,CR3,CR4,CR5,CR6,CR7)		6
-12	EB-1035	. RESISTOR, Insulated, fixed composition, 10K ohms ± 5%, ½ w (△6143K12P109) (V01121) (R16).		1
-13	EB-2235	. RESISTOR, Insulated, fixed composition, 22K ohms ± 5%, ½ w (△6143K12P121) (V01121) (R12).		1
-14	30D-25 mfd	. CAPACITOR, Electrolytic, dc, aluminum, 25 mfd - 20 + 75%, 25 VDC (△2098K16P001)(V56289)(C7,C12,C14)		3
-15	EB-1525	. RESISTOR, Insulated, fixed composition 1500 ohms ± 5%, ½ w (△6143K12P079) (V01121)(R13)		1
-16	EB-5625	. RESISTOR, Insulated, fixed composition, 5600 ohms ± 5%, ½ w (△6143K12P100) (V01121) (R14).		1
-17	6143K60P001	. RESISTOR, Composition, module (RP 2 consisting of R1,R2,R3,R4,R5) . . .		1
-18	54C23	. CAPACITOR, Ceramic, 0.1 mfd - 20 + 80%, 3 VDC (△2092K60P020)(V56289)(C8) .		1
-19	6845K61P001	. TRANSISTOR, PNP, Germanium,low power (2N1175 selected for specific value of hfe) (Q1,Q2,Q3).		3
-20	8600K45P001	. TRANSFORMER (T2)		1
-21	40C322	. CAPACITOR, Ceramic, 0.22 mfd - 20 + 80%, 3 VDC (△2092K60P021)(V56289)(C4) .		1
-22	4930K60P001	. LEAD		1

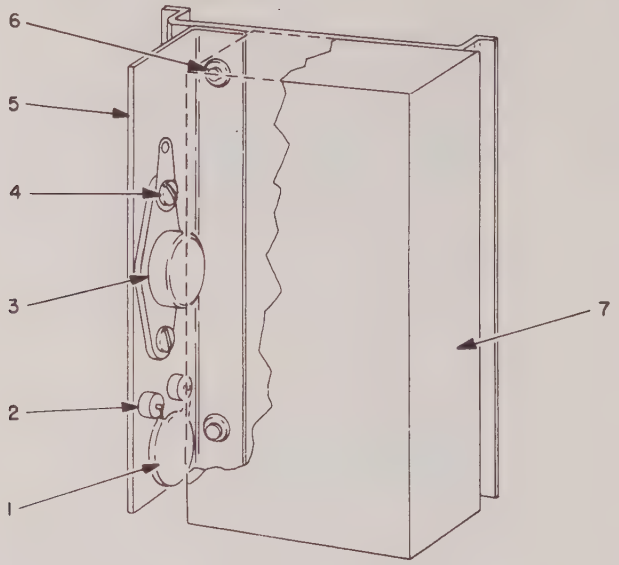


Figure 2-3. Heat Sink Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
2-3-	7639K40G700	HEAT SINK ASSEMBLY (See item 8, figure 2-1)		Ref
-1	41C92	. CAPACITOR, Ceramic, 0.1 mfd - 20 + 80%, 500 VDC, (△2092K90P003) (V56289) (C15)		1
-2	ST-SM-36TOR	. TERMINAL, Turret, (△8318K91P007) (V05009)		2
-3	CQT831	. TRANSISTOR, PNP, Germanium, power (△6847K90P007) (V98925)		2
	732	. INSULATOR, Mica (△4594K60P002) (V08530) (Attaching Parts)		1
-4	NBZME13007	. SCREW, Slotted, pan hd, brass, 0.0002 in. ni. plated, No. 6-32 by 7/16 in. lg .		2
	2506-06-00	. TERMINAL, (△8311K17P004) (V78189) . . .		1
	2150	. WASHER, Flat, fibre, No. 6 (△8900K70P009) (V83330).		1
	NTAME07000	. WASHER, Plain, brass, 0.0002 in. ni plated No. 6		2
	NLMNE13000	. NUT, Hex, brass, 0.0002 in. ni plated, No. 6-32.		2
		---*---		
-5	1714K67G701	. BRACKET ASSEMBLY . . . . . (Attaching Parts)		1
-6	NBZME13004	. SCREW, Slotted, pan hd, brass, 0.0002 in. ni plated No. 6-32 by ¼ in. lg. . .		2
	NTMPE13000	. LOCKWASHER, Internal tooth, phosphor, bronze, 0.0002 in. ni plated, No. 6 .		2
		---*---		
-7	8600K43P001	. TRANSFORMER.		1

SECTION III
PEN CARRIAGE ASSEMBLY
P/N 2146K40

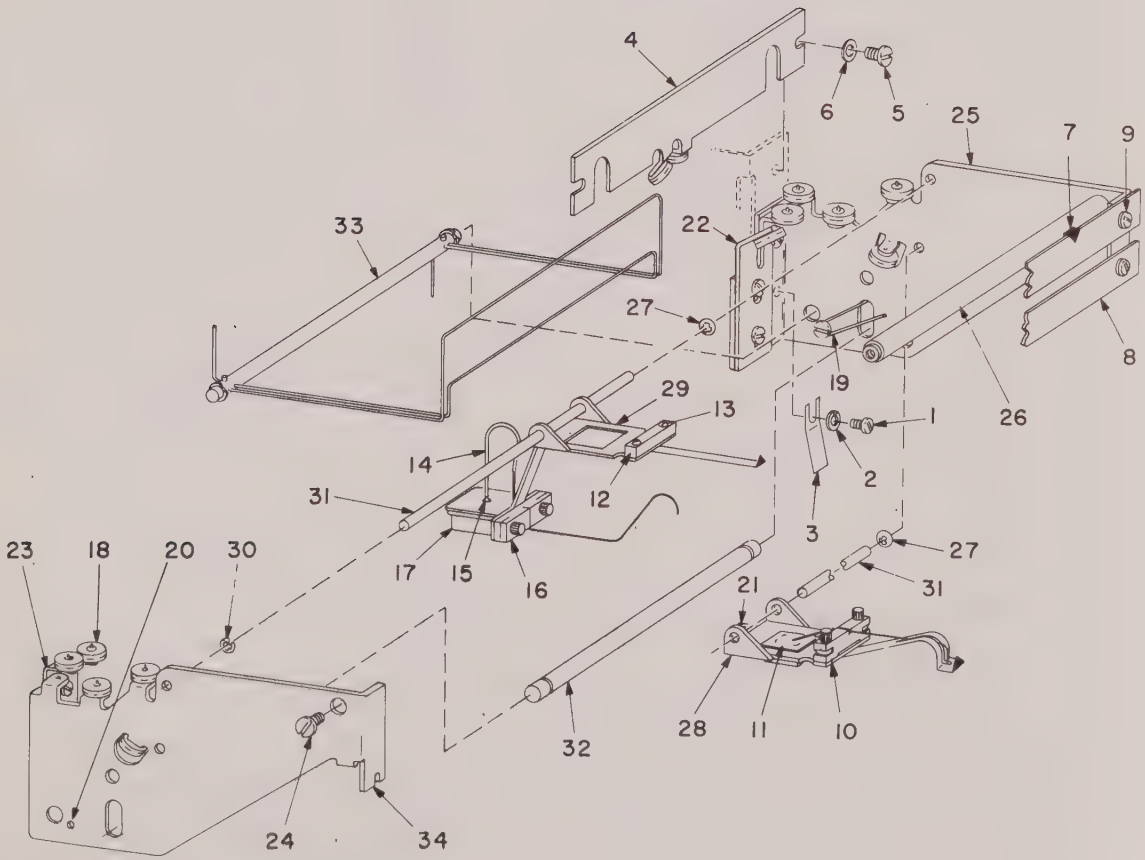


Figure 3-1. Pen Carriage Assembly

This section contains a Group Assembly Parts List for Pen Carriage Assembly 2146K40, groups G700 thru G703. The group number of your particular pen carriage is stamped on one of its side plates.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code column, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability List

2146K40	No. (Letter →)	A	B	C
G700	0		X	
G701	1		X	X
G702	2	X		
G703	3	X		X

PARTS LIST

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
3-1-	2146K40	PEN CARRIAGE ASSEMBLY		Ref
		(Attaching Parts)		
-1	NBCED13004	CAPSCREW, Button hd, hex socket, steel, cad plated, No.6-32 by ¼ in. lg		4
-2	NTMPE13000	LOCKWASHER, Internal tooth, phosphor, bronze, 0.0002 in. ni plated, No.6 . .		4
-3	7922K60P001	SPRING		1
		---*---		
-4	1714K62G700	. BRACKET ASSEMBLY		1
		(Attaching Parts)		
-5	NBZME13004	. SCREW, Slotted, pan hd, brass, 0.0002 in. ni plated, No.6-32 by ¼ in. lg.		2
-6	NTLPE13000	. LOCKWASHER, External tooth, phosphor bronze, 0.0002 in. ni plated, No.6 .		2
		---*---		
	NTYCM00007	. . RING, Retaining, open		2
	5897K40P001	. . PULLEY.		2
	5809K48P001	. . POST.		2
-7	5779K41P001	. POINTER.	1	1
	5779K41P002	. POINTER.	3	1
-8	†6471K41P---	. SCALE.	A	1
	†6471K41P---	. SCALE.	B	2

† See stamping on part for complete part number.

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
		(Attaching Parts)		
3-1-9	NBZME06002	. SCREW, Slotted, pan hd, brass,0.0002 in. ni plated,No. 3-56 by 1/8 in. lg. . ---*---		4
-10	8096K62G700	. SUPPORT ASSEMBLY		1
	6509K60P001	. . SCREW, Knurled hd		2
	6311K12P035	. . "O" RING.		2
	5619K60G700	. . PEN ASSEMBLY.		1
-11	4496K60G700	. INKWELL ASSEMBLY		1
-12	8953K60P002	. WEIGHT, Balance. . . . . (Attaching Parts)	B	1
-13	NBZME05007	. SCREWS, Slotted, pan hd, brass 0.0002 in. ni plated, No.2-56 by 7/16 in.lg ---*---	B	2
-14	8736K63P001	. TUBING	B	1
-15	8690K60G700	. TUBE ASSEMBLY.	B	1
-16	8096K62G701	. SUPPORT ASSEMBLY	B	1
	6509K60P001	. . SCREW, Knurled hd	B	2
	6311K12P035	. . "O" RING.	B	2
	5619K60G701	. . PEN ASSEMBLY.	B	1
-17	4496K60G700	. INKWELL ASSEMBLY	B	1
-18	NTYCM00007	. RING, Retaining, open.	0	7
	NTYCM00007	. RING, Retaining, open.	1	13
	NTYCM00007	. RING, Retaining, open.	2	2
	NTYCM00007	. RING, Retaining, open.	3	8
	5897K40P001	. PULLEY	0	7
	5897K40P001	. PULLEY	1	13
	5897K40P001	. PULLEY	2	2
	5897K40P001	. PULLEY	3	8
	5809K48P001	. POST	0	7
	5809K48P001	. POST	1	13
	5809K48P001	. POST	2	2
	5809K48P001	. POST	3	8
-19	7922K62P002	. SPRING . . . . . (Attaching Parts)		1
	6566K63P001	. SCREW.		1
	COML	. LOCKWASHER, No.3, internal tooth . . . ---*---		1
-20	7922K62P001	. SPRING . . . . . (Attaching Parts)		1
	6566K63P001	. SCREW.		1
	COML	. LOCKWASHER, No.3, internal tooth . . . ---*---		1
-21	2341K60P001	. CLAMP. . . . . (Attaching Parts)		2
	NBZME09002	. SCREW, Slotted, pan hd, brass,0.0002 in. ni plated,No.4-40 by 1/8 in.lg. ---*---		2
-22	1696K63P002	. BRACKET. . . . . (Attaching Parts)	C	1
	NBZME06002	. SCREW, Slotted, pan hd, brass, 0.0002 in. ni plated,No.3-56 by 1/8 in.lg. ---*---	C	2

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
3-1-23	1696K63P001	BRACKET.		1
		(Attaching Parts)		
	NBZME06002	SCREW, Slotted, pan hd,brass, 0.0002 in. ni plated,No.3-56 by 1/8 in.lg.		2
		---*---		
-24	NBZME13004	SCREW, Slotted, pan hd,brass, 0.0002 in. ni plated,No.6-32 by ¼ in. lg .		2
-25	5699K60P001	PLATE, Right		1
-26	5809K43P003	POST		1
-27	6288K11P002	RING, Retaining.	A	1
	6288K11P002	RING, Retaining.	B	2
-28	8096K60G700	SUPPORT ASSEMBLY		1
-29	8096K61G700	SUPPORT ASSEMBLY	B	1
-30	NTYCM00012	RING, Retaining, open.	A	1
	NTYCM00012	RING, Retaining, open.	B	2
-31	7113K46P001	SHAFT.	A	1
	7113K46P001	SHAFT.	B	2
-32	7413K46P002	SHAFT.		1
-33	4999K60G700	PEN LIFTER ASSEMBLY.	A	1
	4999K60G701	PEN LIFTER ASSEMBLY.	B	1
	6288K60P002	. RING, Retaining		2
-34	5699K60P002	PLATE, Left.		1

SECTION IV
CHART CARRIAGE ASSEMBLY
P/N 2145K60

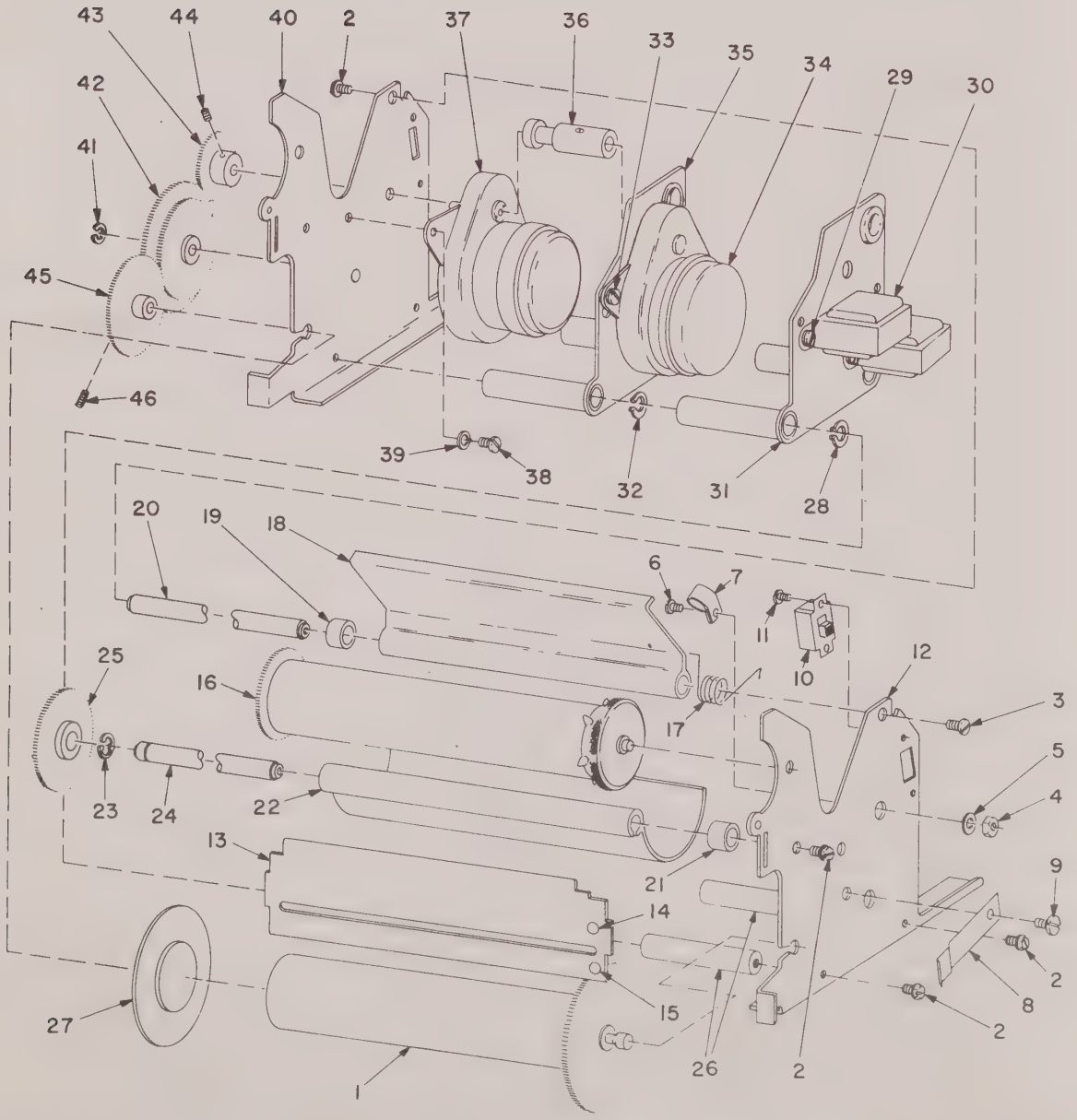


Figure 4-1.Chart Carriage Assembly, P/N 2145K60

This section contains a Group Assembly Parts List for Chart Carriage Assembly 2145K60, groups G700 thru G718. The group number of your particular chart carriage is stamped on one of its side plates.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code column, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability List

	Letter →															
2145K60	No. ↓	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
G700	0	X			X		X					X	X			
G701	1	X			X		X					X	X			
G702	2	X			X		X					X	X			
G703	3	X			X		X					X	X			
G704	4	X			X		X					X	X			
G705	5	X			X		X					X	X			
G706	6	X			X		X					X	X			
G707	7		X		X		X						X		X	
G708	8		X		X		X						X		X	
G709	9		X		X		X						X		X	
G710	10		X		X		X						X		X	
G711	11					X		X					X	X		X
G712	12			X		X		X	X					X		X
G713	13			X		X		X		X				X		X
G714	14			X		X	X		X			X				
G715	15			X		X	X			X		X				
G716	16					X		X			X		X			
G717	17					X		X			X		X	X		
G718	18					X		X					X	X	X	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
4-1-	2145K60	CHART CARRIAGE ASSEMBLY		Ref
--	2143K60G700	. MOTOR AND CARRIAGE ASSEMBLY.	A	1
	2143K60G701	. MOTOR AND CARRIAGE ASSEMBLY.	B	1
	2143K60G702	. MOTOR AND CARRIAGE ASSEMBLY.	11	1
	2143K60G703	. MOTOR AND CARRIAGE ASSEMBLY.	12	1
	2143K60G704	. MOTOR AND CARRIAGE ASSEMBLY.	13	1
	2143K60G705	. MOTOR AND CARRIAGE ASSEMBLY.	14	1
	2143K60G706	. MOTOR AND CARRIAGE ASSEMBLY.	15	1
	2143K60G708	. MOTOR AND CARRIAGE ASSEMBLY.	16	1
	2143K60G709	. MOTOR AND CARRIAGE ASSEMBLY.	17	1
	2143K60G710	. MOTOR AND CARRIAGE ASSEMBLY.	18	1
-1	6139K40G700	. . REROLL ASSEMBLY		1
-2	NBLAE13004	. . SCREW, Hex washer hd,steel,ni plated, No.6-32 by ¼ in. lg.		7
-3	NBZME13004	. . SCREW, Slotted,pan hd,brass,0.0002 in. ni plated,No.6-32 by ¼ in.lg		1
-4	NLMNE15000	. . NUT, Hex,brass,0.0002 in. ni plated, No.8-32.	C	1
-5	NTMPE16000	. . LOCKWASHER, Internal tooth, phosphor bronze,0.0002 in.cad.plated,No.8	C	1
-6	NBZME15006	. . SCREW,Slotted pan hd,brass,0.0002 in. ni plated,No.8-32 by 3/8 in.lg .	C	1
-7	2343K11P018	. . CLAMP, Cable.	C	1
--	5713K60G700	. . PLATE ASSEMBLY, Right	D	1
	5713K60G701	. . PLATE ASSEMBLY, Right	E	1
-8	7923K63P001	. . . SPRING		1
		(Attaching Parts)		
-9	NBZME16003	. . . SCREW,Slotted pan hd,brass,0.0002 in. ni plated,10-32 by 3/16 in. lg.		1
	5438K60P101	. . . NUT, Clinch.		1
		---*---		
-10	SS-37	. . . SWITCH, Slide,SPST(△8159K40P002) (V78488).	F	1
	SS-31	. . . SWITCH,Slide,3 position (△8159K40P005)(V78488) . . .	G	1
		(Attaching Parts)		
-11	NBZME09003	. . . SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No.4-40 by 3/16 in. lg.	D	2
	NBZME09002	. . . SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No.4-40 by 1/8 in. lg.	E	2
	NTMPE11000	. . . LOCKWASHER,Internal tooth,phosphor,bronze,0.0002 in. ni plated, No.4.	F	2
	5438K60P005	. . . NUT, Clinch.		2
		---*---		
-12	5678K43P004	. . . PLATE.	F	1
	5678K43P006	. . . PLATE.	G	1
-13	8245K40P001	. . TABLE, Writing.	M	1
	8243K60G700	. . TABLE ASSEMBLY.	H	1
	8243K60G701	. . TABLE ASSEMBLY.	J	1
--	8245K40P001	. . . TABLE, Writing	B	1

FIG. & INDEX NO.	PART NO.	DESCRIPTION	USAGE CODE	UNITS PER ASSY
4-1-14	4872K60G700	. . . LAMP ASSEMBLY (Red).	B	1
-15	4872K60G701	. . . LAMP ASSEMBLY (Amber).	J	1
-16	3287K40G700	. . TIMING DRUM ASSEMBLY.		1
-17	7923K46P001	. . SPRING.		1
-18	2817K41P001	. . COVER		1
-19	7671K41P004	. . SLEEVE.		1
-20	5809K43P004	. . POST.		1
-21	7671K41P004	. . SLEEVE.		1
-22	4225K40P001	. . HOLDER, Paper		1
-23	5103-25	. . RING,Retaining,external (△6288K60P001)(V79136). . . .		1
-24	5809K43P002	. . POST.		1
-25	3867K42G700	. . GEAR AND HUB ASSEMBLY		1
-26	5809K43P001	. . POST.	D	2
	5809K43P006	. . POST.	E	2
-27	4390K40G700	. . HUB ASSEMBLY.		1
	8615K61G700	. . TRANSFORMER AND PLATE ASSEMBLY. . .	J	1
	8615K61G701	. . TRANSFORMER AND PLATE ASSEMBLY. . .	H	1
		(Attaching Parts)		
-28	5103-25	. . RING,Retaining,external (△6288K60P001)(V79136). . . .	C	2
		---*---		
-29	NBZME09003	. . . SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No.4-40 by 3/16 in. lg.	H	2
	NBZME09003	. . . SCREW,Slotted, pan hd, brass, 0.0002 in. ni plated, No. 4-40 by 3/16 in. lg.	J	4
	NTMPE11000	. . . LOCKWASHER,Internal tooth,phosphor bronze,0.0002 in. ni plated, No. 4	H	2
	NTMPE11000	. . . LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in. ni plated, No. 4	J	4
	2343K90P001	. . . CLAMP, Cable	C	1
-30	8615K62G700	. . . TRANSFORMER ASSEMBLY	H	1
	8615K62G700	. . . TRANSFORMER ASSEMBLY	J	2
-31	5721K65G700	. . . PLATE ASSEMBLY	H	1
	5721K65G701	. . . PLATE ASSEMBLY	J	1
	3015	. . . . GROMMET, Rubber (△4029K10P008)(V05581). .	C	1
	5438K60P005	. . . . NUT, Clinch	H	3
	5438K60P005	. . . . NUT, Clinch	J	5
--	5360K63G700	. . MOTOR AND PLATE ASSEMBLY.	N	1
	5360K63G701	. . MOTOR AND PLATE ASSEMBLY.	16	1
		(Attaching Parts)		
-32	5103-25	. . RING,Retaining, external (△6288K60P001)(V79136). . . .	G	2
		---*---		
-33	NBZME09003	. . . SCREW, Slotted, pan hd, brass, 0.0002 in. ni plated No.4-40 by 3/16 in. lg.	G	2

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
4-1-33	NTMPE11000	. . . LOCKWASHER,Internal tooth,phosphor bronze,0.0002 in. ni plated, No.4.	G	2
-34	*5360K60G702	. . . MOTOR ASSEMBLY (1/5 rpm). . . .	16	1
	*5360K60G706	. . . MOTOR ASSEMBLY (1/15 rpm) . . .	N	1
-35	5721K65G702	. . . PLATE ASSEMBLY	G	1
	3015	. . . . GROMMET,Rubber(△4029K10P008) (V05581)	G	1
	5438K60P005	. . . . NUT, Clinch	G	2
-36	7425K60G700	. . SHAFT ASSEMBLY.	G	1
	NKJCT09002	. . . SCREW,Hex socket,steel,cad plated,No.4-40 by 3/16 in.lg . .	G	1
-37	*5360K60G703	. . MOTOR ASSEMBLY (2 rpm).	K	1
	*5360K60G706	. . MOTOR ASSEMBLY (1/15 rpm). . . .	L	1
	*5360K60G707	. . MOTOR ASSEMBLY (4 rpm).	P	1
	*5360K60G708	. . MOTOR ASSEMBLY (4 rpm).	Q	1
		(Attaching Parts)		
-38	NBZME09003	. . SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No.4-40 by 3/16 in. lg		2
-39	NTMPE11000	. . LOCKWASHER,Internal tooth,phosphor bronze,0.0002 in. ni plated,No.4		2
		---*---		
-40	5712K60G700	. . PLATE ASSEMBLY, Left.		1
--	5438K60P005	. . . NUT, Clinch.		2
-41	5133-12C	. . RING,Retaining, external (△6288K42P057) (V96768)		1
-42	*3867K60G700	. GEAR AND HUB ASSEMBLY, Green (100 tooth) and clear (125 tooth)		1
	*3867K60G701	. GEAR AND HUB ASSEMBLY, Yellow (96 tooth) and orange (30 tooth)		1
	*3867K60G702	. GEAR AND HUB ASSEMBLY, Orange (90 tooth) and red (40 tooth).		1
	*3867K60G703	. GEAR AND HUB ASSEMBLY, Orange (90 tooth) and brown (60 tooth).		1
	*3867K60G704	. GEAR AND HUB ASSEMBLY, Red (80 tooth) and brown (60 tooth).		1
	*3867K60G705	. GEAR AND HUB ASSEMBLY, Brown (60 tooth) and brown (60 tooth).		1
	*3867K60G706	. GEAR AND HUB ASSEMBLY, Yellow(96 tooth) and green (100 tooth)		1
	*3867K60G709	. GEAR AND HUB ASSEMBLY, Yellow(96 tooth) and brown (60 tooth).		1
-43	*3867K40G706	. GEAR AND HUB ASSEMBLY, Green(20 tooth)		1
	*3867K40G707	. GEAR AND HUB ASSEMBLY,Yellow(24 tooth)		1
	*3867K40G708	. GEAR AND HUB ASSEMBLY,Orange(30 tooth)		1
	*3867K40G709	. GEAR AND HUB ASSEMBLY,Red(40 tooth). .		1
	*3867K40G710	. GEAR AND HUB ASSEMBLY,Brown(60 tooth).		1
-44	NKJCR09002	. . SCREW, Hex socket, steel, 0.0002 in. ni plated,No.4-40 by 1/8 in. lg		1

* Interchangeable parts. Refer to Instruction Manual for proper motor and gear relationship for specific chart speeds.

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
4-1-45	*3867K40G706	. GEAR AND HUB ASSEMBLY,Green(20 tooth).		1
	*3867K40G710	. GEAR AND HUB ASSEMBLY,Brown(60 tooth).		1
	*3867K40G711	. GEAR AND HUB ASSEMBLY,Red(80 tooth). .		1
	*3867K40G712	. GEAR AND HUB ASSEMBLY,Orange(90 tooth)		1
	*3867K40G713	. GEAR AND HUB ASSEMBLY,Clear(120 tooth)		1
-46	NKJCR09002	. . SCREW, Hex socket, steel, 0.0002 in. ni plated,No.4-40 by 1/8 in.lg .		1

* Interchangeable parts. Refer to Instruction Manual for proper motor and gear relationship for specific chart speeds.

SECTION V
CHART CARRIAGE ASSEMBLY
P/N 2145K40

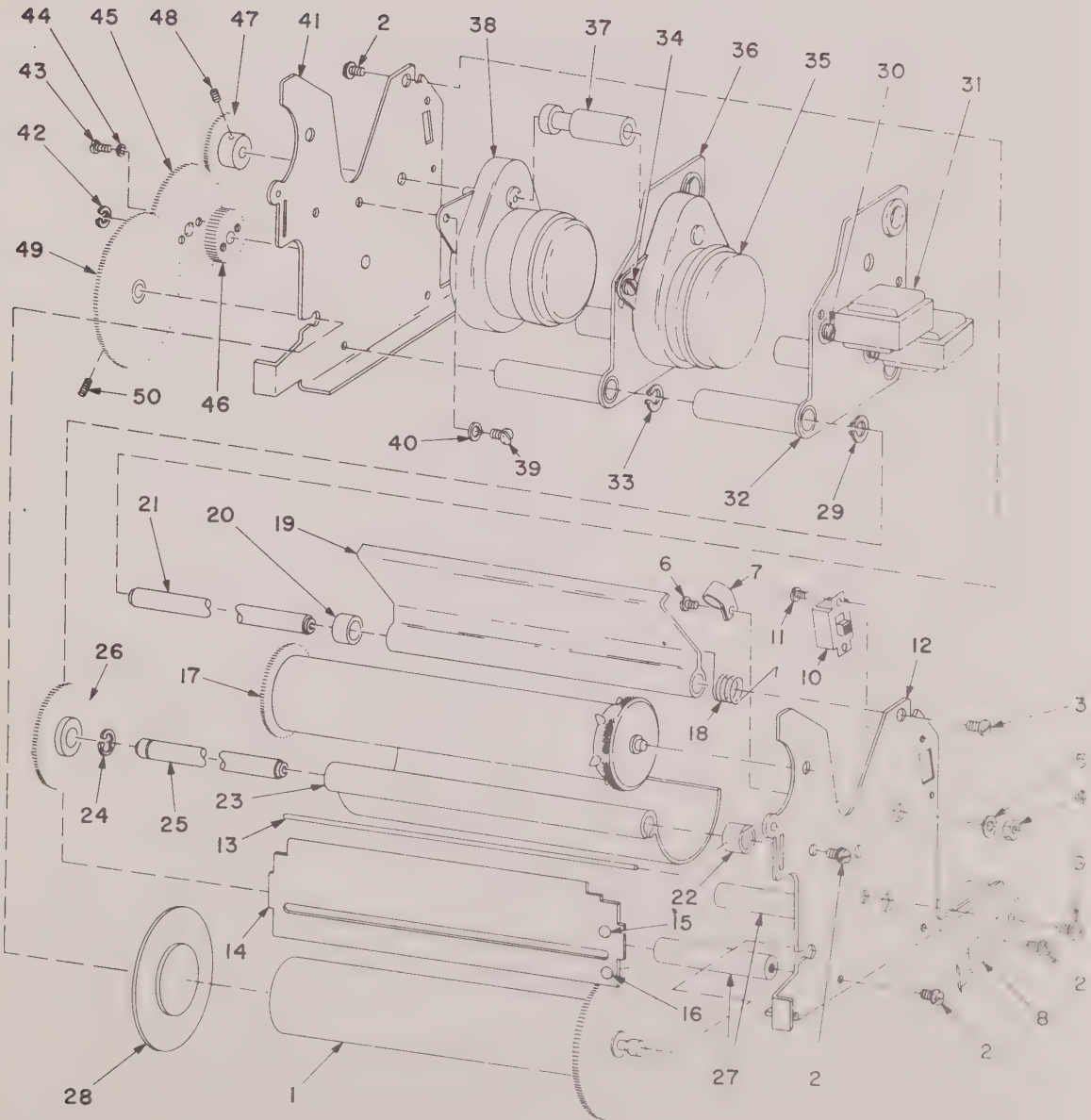


Figure 5-1. Chart Carriage Assembly, P/N 2145K40

This section contains a Group Assembly Parts List for Chart Carriage Assembly 2145K40, groups G700 thru G710; and G720, G722,G724,G726,and G728. The group number of your particular chart carriage is stamped on one of its side plates.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code column, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability List

		Letter												
2145K40	No.	A	B	C	D	E	F	G	H	J	K	L	M	N
G700	0		X		X			X				X		
G701	1		X		X			X				X		
G702	2		X		X			X				X		
G703	3		X		X			X					X	
G704	4		X		X			X					X	
G705	5		X		X			X					X	
G706	6		X		X			X						X
G707	7		X		X			X						X
G708	8		X		X			X						X
G709	9		X		X			X						X
G710	10		X		X			X						
G720	11			X		X	X	X						
G722	12	X		X		X	X		X					
G724	13	X		X		X	X			X	X			
G726	14	X		X	X				X		X			X
G728	15	X		X		X				X	X			X

PARTS LIST

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
5-1-	2145K40	CHART CARRIAGE ASSEMBLY		Ref
-1	6139K40G700	. REROLL ASSEMBLY.		1
-2	NBLAE13004	. SCREW, Hex, washer hd, steel, ni plated,No. 6-32 by ¼ in. lg.		7
-3	NBZME13004	. SCREW, Slotted, pan hd,brass,0.0002 in. ni plated,No. 6-32 by ¼ in. lg. . .		1
-4	NLMNE15000	. NUT, Hex,brass,0.0002 in.ni plated, No.8-32	A	1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
5-1-5	NTMPE16000	. LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated,No.8. .	A	1
-6	NBZME15006	. SCREW, Slotted,pan hd,brass,0.0002 in. ni plated,No.8-32 by 3/8 in.lg. . .	A	1
-7	2343K11P018	. CLAMP, Cable	A	1
--	5713K60G700	. PLATE ASSEMBLY, Right.	B	1
	5713K60G701	. PLATE ASSEMBLY, Right.	C	1
-8	7923K63P001	. . SPRING.		1
		(Attaching Parts)		
-9	NBZME16003	. . SCREW, Slotted, pan hd,brass,0.0002 in. ni plated,No.10-32 by 3/16 in. lg		1
	5438K60P101	. . NUT, Clinch		1
		---*---		
-10	SS-37	. . SWITCH, Slide, SPST (△8159K40P002) (V78488)	D	1
	SS-31	. . SWITCH, Slide, 3 position (△8159K40P005)(V78488).	E	1
		(Attaching Parts)		
-11	NBZME09003	. . SCREW, Slotted, pan hd,brass,0.0002 in. ni plated,No.4-40 by 3/16 in. lg	B	2
	NBZME09002	. . SCREW, Slotted, pan hd,brass,0.0002 in. ni plated,No.4-40 by 1/8 in. lg	C	2
	5438K60P005	. . NUT, Clinch		2
		---*---		
-12	5678K43P001	. . PLATE	B	1
	5678K43P003	. . PLATE	C	1
-13	6368K60P001	. ROD.	F	1
-14	8245K40P001	. TABLE, Writing	G	1
	8243K60G700	. TABLE ASSEMBLY.	H	1
	8243K60G701	. TABLE ASSEMBLY	J	1
--	8245K40P001	. . TABLE, Writing	A	1
-15	4872K60G700	. . LAMP ASSEMBLY (Red)	A	1
-16	4872K60G701	. . LAMP ASSEMBLY (Amber)	J	1
-17	3287K40G700	. TIMING DRUM ASSEMBLY		1
-18	7923K46P001	. SPRING		1
-19	2817K41P001	. COVER.		1
-20	7671K41P004	. SLEEVE		1
-21	5809K43P004	. POST		1
-22	7671K41P004	. SLEEVE		1
-23	4225K40P001	. HOLDER, Paper.		1
-24	5103-25	. RING,Retaining,external(△6288K60P001) (V79136).		1
-25	5809K43P002	. POST		1
-26	3867K42G700	. GEAR AND HUB ASSEMBLY.		1
-27	5809K43P001	. POST	B	2
	5809K43P006	. POST	C	2
-28	4390K40G700	. HUB ASSEMBLY		1
--	8615K61G700	. TRANSFORMER AND PLATE ASSEMBLY	J	1
	8615K61G701	. TRANSFORMER AND PLATE ASSEMBLY	H	1
		(Attaching Parts)		
-29	5103-25	. RING, Retaining, external(△6288K60P001) (V79136).	A	2
		---*---		

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
5-1-30	NBZME09003	. . SCREW, Slotted,pan hd,brass,0.0002 in.ni plated,No.4-40 by 3/16 in. lg	12	2
	NBZME09003	. . SCREW, Slotted,pan hd,brass,0.0002 in.ni plated,No.4-40 by 3/16 in. lg	K	4
	NTMPE11000	. . LOCKWASHER, Internal tooth,phosphor bronze,0.0002 in.ni plated,No.4.	12	2
	NTMPE11000	. . LOCKWASHER, Internal tooth,phosphor bronze,0.0002 in.ni plated,No.4.	K	4
	2343K90P001	. . CLAMP, Cable.	A	1
-31	8615K62G700	. . TRANSFORMER ASSEMBLY.	12	1
	8615K62G700	. . TRANSFORMER ASSEMBLY.	K	2
-32	5721K65G700	. . PLATE ASSEMBLY.	H	1
	5721K65G701	. . PLATE ASSEMBLY.	J	1
	3015	. . GROMMET, Rubber (△4029K10P008) (V05581)	A	1
	5438K60P005	. . NUT, Clinch	H	3
	5438K60P005	. . NUT, Clinch	J	5
--	5360K63G700	. MOTOR AND PLATE ASSEMBLY	F	1
		(Attaching Parts)		
-33	5103-25	. RING, Retaining,external(△6288K60P001) (V79136).	F	2
		---*---		
-34	NBZME09003	. . SCREW, Slotted, pan hd,brass,0.0002 in.ni plated,No.4-40 by 3/16 in. lg	F	2
	NTMPE11000	. . LOCKWASHER, Internal tooth, phosphor bronze,0.0002 in.ni plated, No.4	F	2
-35	5360K60G704	. . MOTOR ASSEMBLY (1/30 rpm).	F	1
-36	5721K65G702	. . PLATE ASSEMBLY.	F	1
	3015	. . . GROMMET, Rubber(△4029K10P008) (V05581).	F	1
	5438K60P005	. . . NUT, Clinch.	F	2
-37	7425K60G700	. SHAFT ASSEMBLY	F	1
	NKJCT09002	. . SCREW, Hex socket,steel,cad plated, No.4-40 by 3/16 in. lg	F	1
-38	*5360K60G700	. MOTOR ASSEMBLY (1/30 rpm).	L	1
	*5360K60G701	. MOTOR ASSEMBLY (1 rpm)	N	1
	*5360K60G702	. MOTOR ASSEMBLY (1/5 rpm)	M	1
	*5360K60G703	. MOTOR ASSEMBLY (2 rpm)	10	1
	*5360K60G705	. MOTOR ASSEMBLY (2 rpm)	F	1
		(Attaching Parts)		
-39	NBZME09003	. SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No.4-40 by 3/16 in.lg . .		2
-40	NTMPE11000	. LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated,No.4. .		2
		---*---		
-41	5712K60G700	. PLATE ASSEMBLY, Left		1
--	5438K60P005	. . NUT, Clinch		2

* Interchangeable parts. Refer to Instruction Manual for proper motor and gear relationship for specific chart speeds.

SECTION VI
REFERENCE BOARD ASSEMBLY
P/N 1606K60 and 1606K61

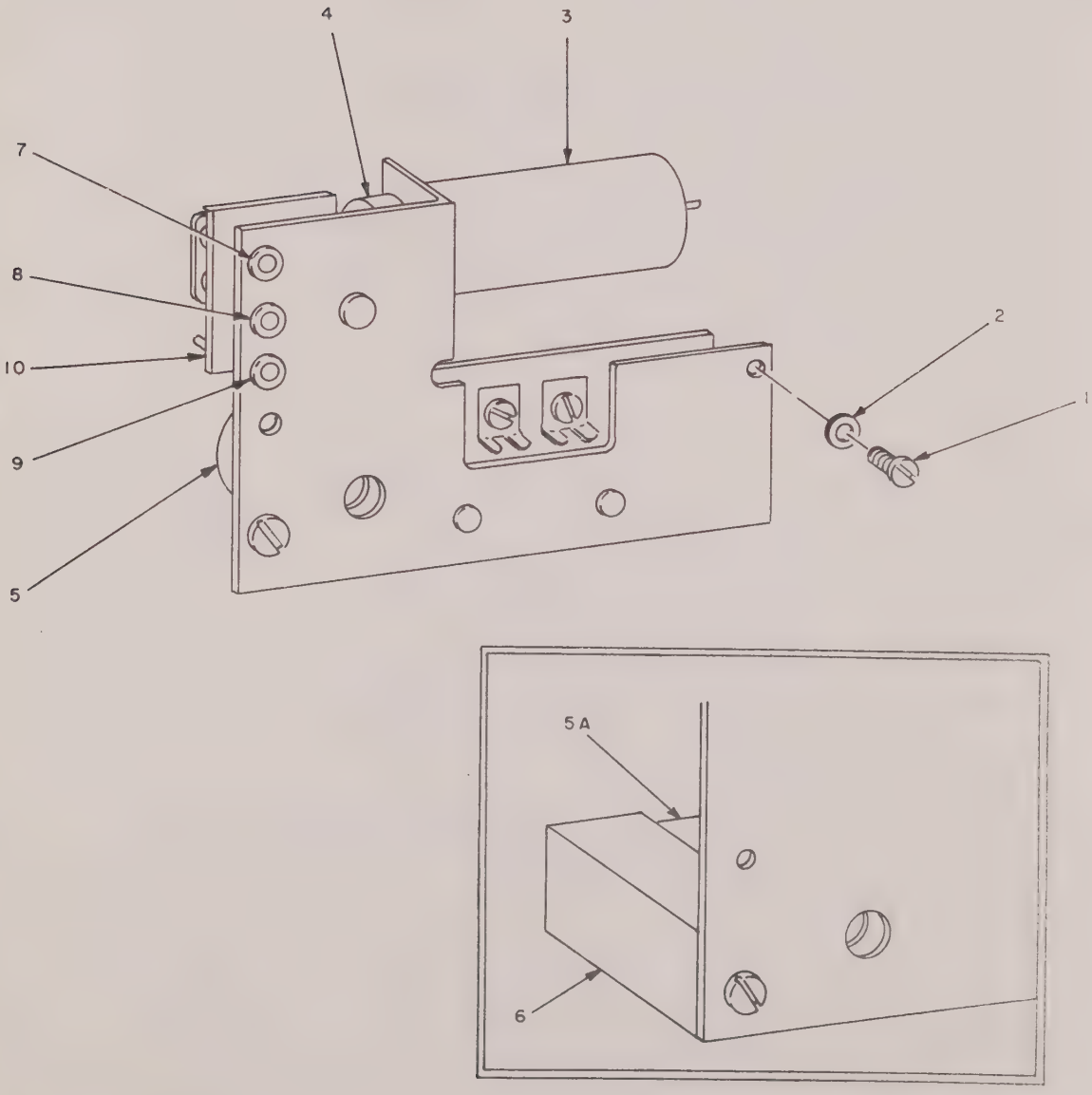


Figure 6-1. Reference Board Assembly, P/N 1606K60

This section contains two Group Assembly Parts Lists: One list for reference board assembly 1606K60, applicable to Miniature Recorder Types 520 and 521; and the other list for reference board assembly 1606K61, applicable to Miniature Recorder Types 530 and 531. Reference board assembly 1606K60 is identified by recorder function: MV (millivolt) or TC (thermocouple) recorder; RTD (resistance temperature detector) recorder; and MH-Radiamatic recorder.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code Column of the 1606K60 reference board assembly, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability List
(1606K60 Reference Board Assembly)

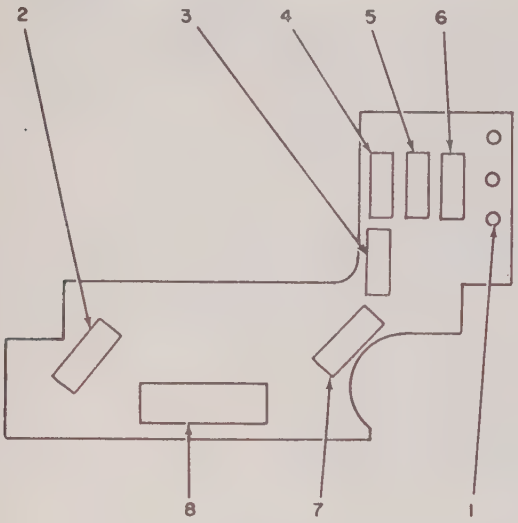
Recorder Function	A	B	C	D	E
MV or TC			X	X	X
RTD	X		X		
MH-Radiomatic		X			X

PARTS LIST

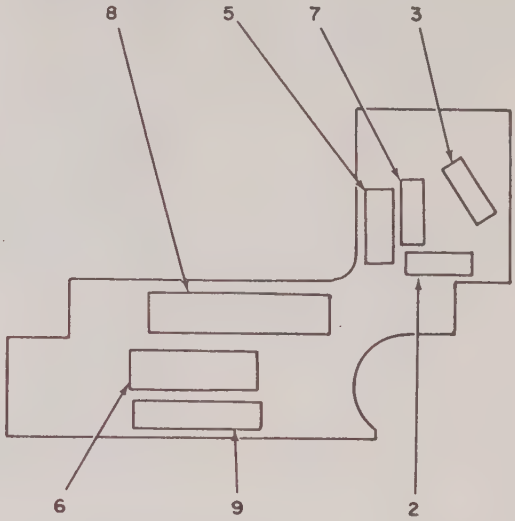
FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
6-1-	1606K60	REFERENCE BOARD ASSEMBLY (Attaching Parts)		Ref
-1	NBZME09003	SCREW, Slotted, pan hd,brass,0.0002 in. ni plated, No.4-40 by 3/16 in.lg . . .		2
-2	NTMPE11000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated,No.4 . . .		2
		---*---		
-3	**5976K60---	. RANGE ASSEMBLY		1
-4	S-153-125	. SOCKET, Saddle type, bottom mounted, 7 pin (△7762K92P006)(V95354) . . . (Attaching Parts)		1
	NPMMR12008	. RIVET, Oval hd, No. 0.123 by 1/8 in.lg		2
		---*---		
-5	117-1000 ohms	. POTENTIOMETER, 1000 ohms, ± 20%, 2 w (△5840K43P103)(V11236)(R22). . . . (Attaching Parts)	C	1
	NBZME09004	. SCREW,Slotted, pan hd,brass,0.0002 in. ni plated,No. 4-40 by ¼ in.lg . .	C	1
	NTAME05000	. WASHER, Plain finish, brass, 0.0002 in. ni plated, No. 4	C	1
	NTMPE11000	. LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated, No.4 .	C	1

** See actual part for complete part number.

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
6-1-5	NLMNE09000	NUT, Hex,brass,0.0002 in.ni plated, No. 4-40.	C	1
		---*---		
-5A	312-64-1K	POTENTIOMETER, 1000 ohms ± 5%, 1 w (△5845K71P015)(V98350)(R22). . . .	B	1
		(Attaching Parts)		
	NBZME03005	SCREW,Slotted, pan hd,brass,0.0002 in. ni plated, No. 1-64 by 5/16 in.lg .	B	1
		---*---		
-6	8089K65P001	SUPPORT.	B	1
		(Attaching Parts)		
	NBZME09004	SCREW,Slotted,pan hd,brass,0.0002 in. ni plated, No. 4-40 by ¼ in.lg. . .	B	1
	NTMPE11000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated, No.7 .	B	1
		---*---		
-7	SKT-8	JACK, Test (Black) (△4643K41P013) (V05009).	A	1
-8	SKT-8	JACK, Test (White) (△4643K41P011) (V05009).	A	1
-9	SKT-8	JACK, Test (Red) (△4643K41P012) (V05009).	A	1
-10	NO NUMBER	TERMINAL BOARD ASSEMBLY.		1
		(See figure 6-2)		
6-2-	NO NUMBER	TERMINAL BOARD ASSEMBLY		Ref
		(See figure 6-1)		
-1	NBZME05004	SCREW,Slotted, pan hd,brass,0.0002 in. ni plated,No. 2-56 by ¼ in.lg . . .	D	3
-2	IN645	DIODE, Silicon, 225V (△6705K90P010) (V03877) (CR10)		1
-3	R1375-70 ohms	RESISTOR, Wire wound, 70 ohms, ± 0.1%, (△6148K60P001)(V15909)(R19). . . .	E	1
	CB-100 ohms	RESISTOR, Composition, 100 ohms, ± 5%, ¼ w (△6143K25P053)(V01121)(R19). .	A	1
-4	EB-5655	RESISTOR, Insulated, fixed composition 5.6 megohms ± 5% (△6143K12P210) (V01121)(R23)	D	1
	R1391-60K ohms.	RESISTOR, Wire wound, 60K ohms ± 0.1%, ¼ w (△6148K60P451)(V15909)(R23). .	B	1
-5	DAS-1-2700 ohm.	RESISTOR, Wire wound, precision, 2700 ohms ± 1% (△6146K93P038)(V15909) (R21)	E	1
	6144K17P030	RESISTOR, Wire wound, 600 ohms ± 5%, 5 w (△6144K17P030)(V12697)(R21) . .	A	1
-6	R1391	RESISTOR, Wire wound, 18K ± 0.1%, (△6148K60P003)(V5909)(R20)	E	1
-7	N4-B	DIODE, Breakdown, 8.4V (△6707K60P010) (V06486) (CR8).	E	1
	IN758	DIODE, Breakdown, 10V (△6707K10P092) (V07910)(CR8)	A	1



G700, G701, G702 AND G704



G703

Figure 6-2. Terminal Board Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
6-2-8	30D-50 mfd	. CAPACITOR, Electrolytic, dc, aluminum, 50 mfd,-10% + 75%, 50VDC (△2098K92P151) (V56289) (C15). . .		1
-9	30D-250 mfd	. CAPACITOR, Electrolytic, dc, aluminum, 250 mfd,-10% + 75%, 12VDC (△2098K92P098)(V56289)(C19) . . .	A	1
6-3-	1606K61G700	REFERENCE BOARD ASSEMBLY		Ref
		(Attaching Parts)		
-1	NBZME09003	SCREW, Slotted, pan hd,brass,0.0002 in. ni plated,No. 4-40 by 3/16 in.lg . . .		2
-2	NTMPE09000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated, No.3 . .		2
		---*---		
-3	117-200 ohms	. POTENTIOMETER, 200 ohms, ± 20%, 2 w (△5840K43P102)(V11236)		1
		(Attaching Parts)		
-4	NLMNE09000	. NUT, Hex,brass,0.0002 in.ni plated, No. 4-40.		2
	NTMPE11000	. LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated, No.4 .		2
	NTAME05000	. WASHER, Plain finish,brass,0.0002 in. ni plated, No. 4		2

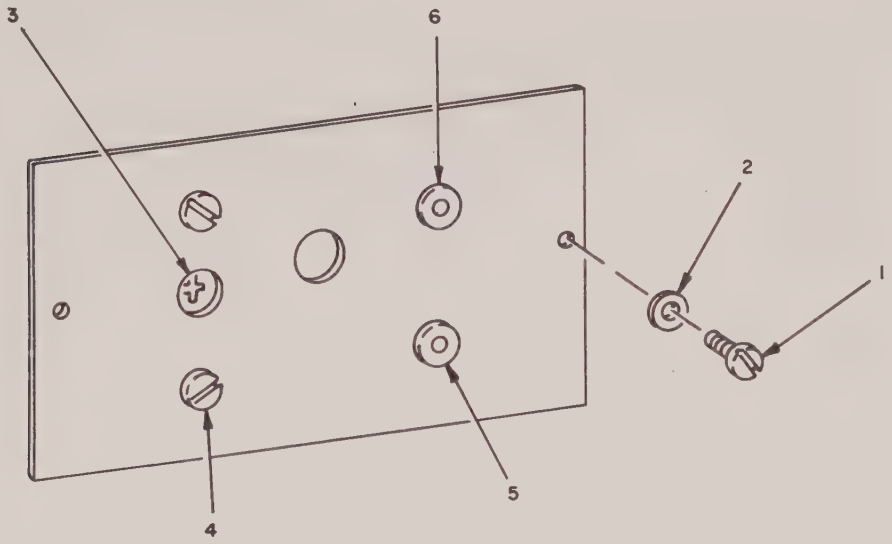


Figure 6-3. Reference Board Assembly, P/N 1606K61

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
6-3-4	NBZME09005	. SCREW, Slotted, pan hd,brass,0.0002 in. ni plated, No.4-40 by 5/16 in.lg. . ---*---		2
-5	SKT-8	. JACK, Test (Black)(△4643K41P013) (V05009).		1
-6	SKT-8	. JACK, Test (Red) (△4643K41P012) (V05009).		1

SECTION VII
BRACKET ASSEMBLY
P/N 1714K43

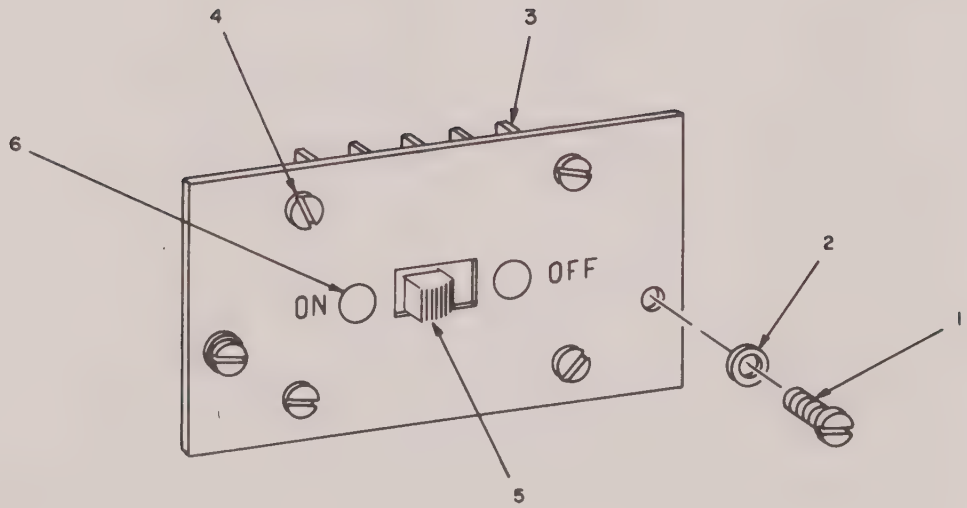


Figure 7-1. Bracket Assembly

This section contains a Group Assembly Parts List for Bracket Assembly 1714K43, and is applicable for the Miniature Recorder Types 520, 521, 530, and 531.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description.

PARTS LIST

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
7-1-	1714K43	BRACKET ASSEMBLY		Ref
		(Attaching Parts)		
-1	NBZME13003	SCREW, Slotted, pan hd, brass, 0.0002 in. ni plated, No.6-32 by 3/16 in. lg. . .		2
-2	NTMPE13000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 ni plated, No.6		2
		---*---		
-3	1561K40P026	. BLOCK, Terminal.		2
		(Attaching Parts)		
-4	NLMNE09000	. NUT, Hex, brass, 0.0002 in.ni plated, No.4-40		2
	NTMPE11000	. LOCKWASHER, Internal tooth, phosphor, bronze,0.0002 in.ni plated, No.4. .		2
	NBZME09008	. SCREW, Slotted, pan hd,brass,0.0002 in. ni plated,No.4-40 by ½ in. lg . . .		2
		---*---		
-5	SS-37	. SWITCH, SPST,slide, 6A,125V (△8159K40P002)(V78488)		1
		(Attaching Parts)		
-6	NPMMR12008	. RIVET, Oval hd,brass,ni plated, 0.123 in. by ½ lg		2
		---*---		

SECTION VIII
ELEMENT ASSEMBLY
P/N 3378K60

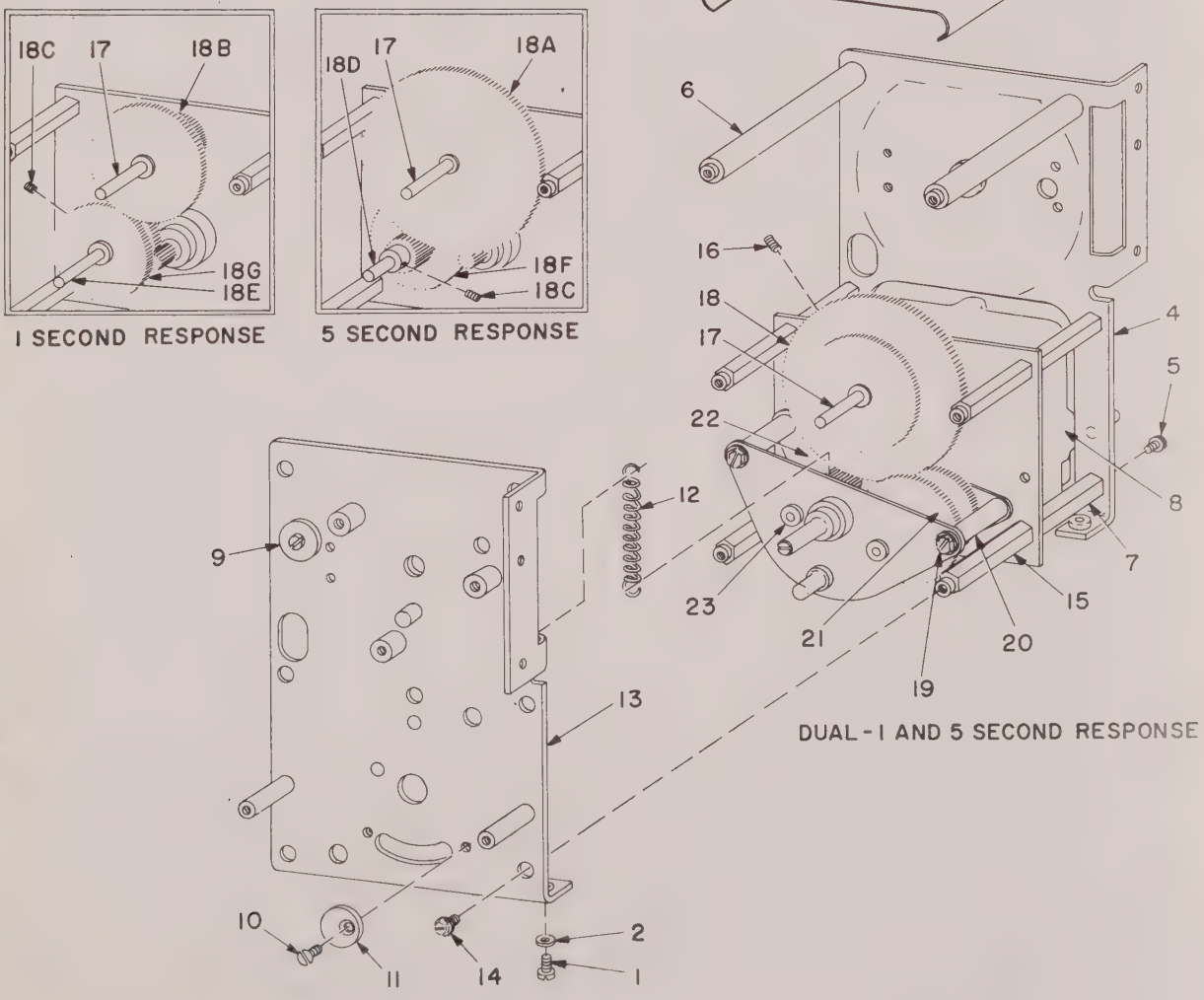


Figure 8-1. (Sheet 1) Element Assembly, P/N 3378K60

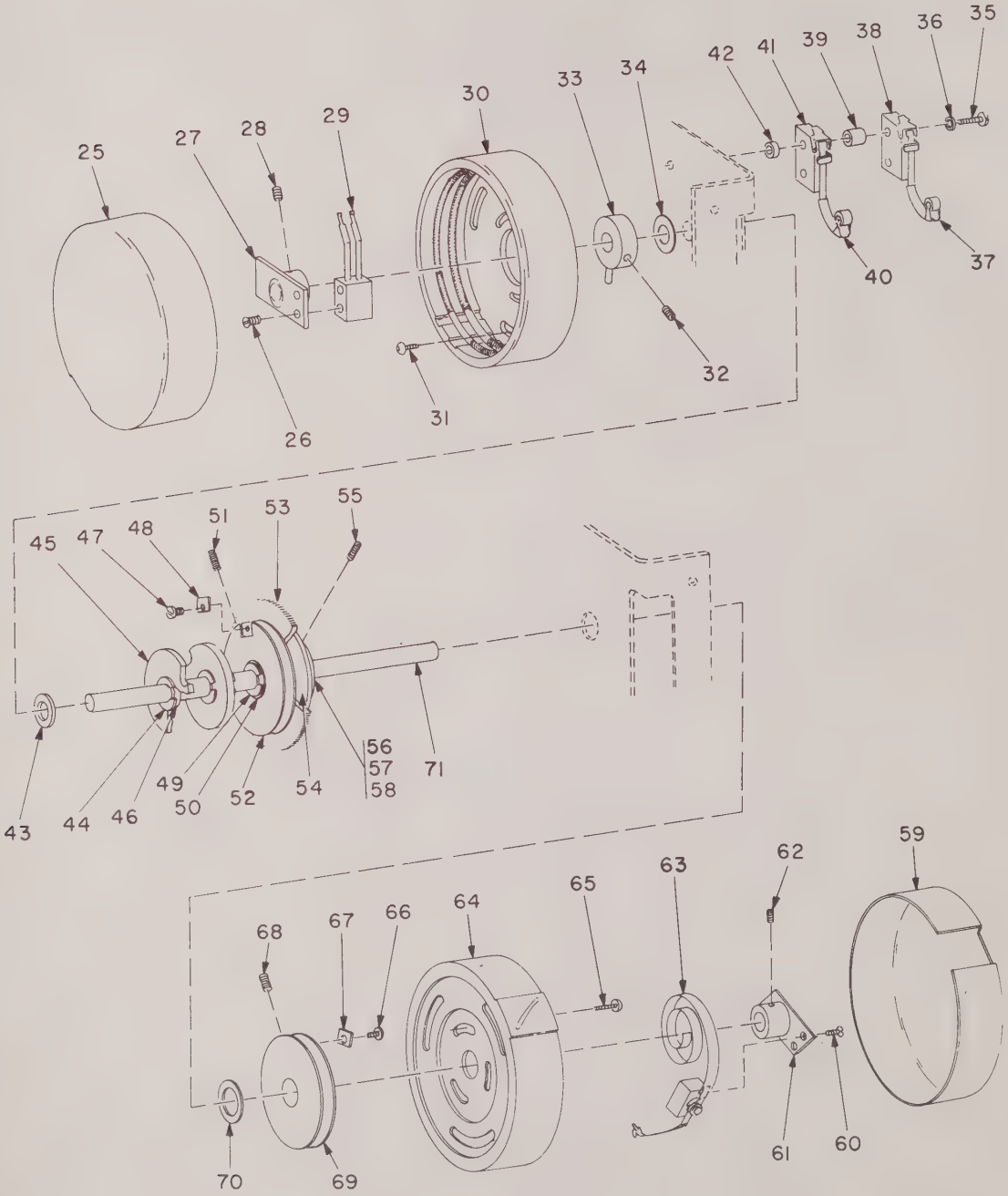


Figure 8-1. (Sheet 2) Element Assembly, P/N 3378K60

This section contains a Group Assembly Parts List for Element Assembly 3378K60, Groups G700 thru G735, for Miniature Recorder Types 530 and 531. The group number of your particular element assembly is stamped on its side.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code column, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability List

		Letter →													
3378K60G	No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
700	0	X			X				X	X					
701	1	X			X				X	X		X		X	
702	2	X			X				X	X			X	X	
703	3	X			X				X	X					X
704	4	X			X				X	X		X		X	X
705	5	X			X				X	X			X	X	X
706	6		X			X			X	X					
707	7		X			X			X	X		X		X	
708	8		X			X			X	X			X	X	
709	9		X			X			X	X					X
710	10		X			X			X	X		X		X	X
711	11		X			X			X	X			X	X	X
712	12	X			X				X		X				
713	13	X			X				X		X	X		X	
714	14	X			X				X		X		X	X	
715	15	X			X				X		X				X
716	16	X			X				X		X	X		X	X
717	17	X			X				X		X		X	X	X
718	18		X			X			X		X				
719	19		X			X			X		X	X		X	
720	20		X			X			X		X		X	X	
721	21		X			X			X		X				X
722	22		X			X			X		X	X		X	X
723	23		X			X			X		X		X	X	X
724	24	X		X			X								
725	25	X		X			X					X		X	
726	26	X		X			X						X	X	
727	27	X		X			X								X
728	28	X		X			X					X		X	X
729	29	X		X			X						X	X	X
730	30		X	X				X							
731	31		X	X				X				X		X	
732	32		X	X				X					X	X	
733	33		X	X				X							X
734	34		X	X				X				X		X	X
735	35		X	X				X					X	X	X

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
8-1-	3378K60	ELEMENT ASSEMBLY (Attaching Parts)		Ref
-1	NBZME13004	SCREW,Slotted, pan hd,brass,0.0002 in. ni plated, No.6-32 by ¼ in.lg.		4
-2	NTMPE13000	LOCKWASHER, Internal tooth, phosphor bronze,0.0002 in.ni plated,No.6. . . . ---*---		4
-3	5681K45P001	. PLATE, Cover		1
-4	5700K42G701	. PLATE ASSEMBLY, Right.	A	1
	5700K42G704	. PLATE ASSEMBLY, Right. . . . . (Attaching Parts)	B	1
-5	NBLAE13004	. SCREW, Hex,washer hd,steel, ni plated, No. 6-32 by ¼ in. lg . . . . . ---*---		6
--	1866K64P002	. . BUSHING		1
--	5438K60P001	. . NUT, Clinch	A	5
--	5438K60P001	. . NUT, Clinch	B	2
-6	5809K43P005	. POST		2
-7	5809K42P003	. POST		4
-8	5360K61G700	. MOTOR ASSEMBLY . . . . . (Attaching Parts)		1
	COML	. . SCREW, Machine, fillister hd, No.8-32 by 1-3/4 in.lg . . . . . ---*---		2
-9	NBZME06005	. SCREW, Slotted,pan hd, brass, 0.0002 in. ni plated, No.3-56 by 5/16 in. lg .	A	1
	7486K60P002	. PULLEY	A	1
	7834K40P004	. SPACER	A	1
-10	NBSME13004	. SCREW, Slotted, fillister hd, brass, 0.0002 in. ni plated, No. 6-32 by ¼ in. lg.	C	2
-11	8900K43P001	. WASHER	C	2
-12	7923K47P001	. SPRING	C	1
-13	5700K41G700	. PLATE ASSEMBLY, Left	D	1
	5700K41G701	. PLATE ASSEMBLY, Left	E	1
	5700K41G702	. PLATE ASSEMBLY, Left	F	1
	5700K41G703	. PLATE ASSEMBLY, Left . . . . . (Attaching Parts)	G	1
-14	NBLAE13004	. SCREW, Hex, washer hd,steel, ni plated, No. 6-32 by ¼ in. lg. . . . . ---*---		6
--	1866K64P002	. . BUSHING, Control shaft.		1
--	1866K64P001	. . BUSHING, Gear shaft	H	2
--	1866K64P001	. . BUSHING, Gear shaft	C	1
--	5438K60P001	. . NUT, Clinch	C	7
--	5438K60P001	. . NUT, Clinch	D	5
--	5438K60P001	. . NUT, Clinch	E	2
-15	5809K42P002	. POST		4
-16	NKJCT09004	. SCREW,Hex socket, cup point, steel,cad plated, No.4-40 by ¼ in. lg		1
-17	7413K41P001	. SHAFT.		1
-18	3867K43G700	. GEAR AND HUB ASSEMBLY.	C	1
-18A	3867K43G701	. GEAR AND HUB ASSEMBLY.	K	1
-18B	3867K43G702	. GEAR AND HUB ASSEMBLY.	J	1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
8-1-18C	NKJCT09002	. SCREW, Hex socket, cup point, steel,cad plated, No. 4-40 by ¼ in.lg	H	1
-18D	7413K41P005	. SHAFT.	K	1
-18E	7413K41P004	. SHAFT.	J	1
-18F	3868K40G700	. GEAR AND PINION ASSEMBLY	K	1
-18G	3867K44G700	. GEAR AND HUB ASSEMBLY.	J	1
--	3869K40G700	. GEAR AND POST ASSEMBLY	C	1
-19	NBLAE13004	. . SCREW, Hex washer hd,steel, ni plated, No.6-32 by ½ in.lg	C	5
-20	8072K40P001	. . STUD.	C	2
-21	3867K44G700	. . GEAR AND HUB ASSEMBLY	C	1
	7413K41P002	. . SHAFT	C	1
	NKJCT09002	. . SCREW, Hex socket, cup point, steel, cad plated, No.4-40 by ¼ in.lg .	C	1
-22	3868K40G700	. . GEAR AND PINION ASSEMBLY.	C	1
	7413K41P003	. . SHAFT	C	1
	NKJCT09002	. . SCREW, Hex socket, cup point, steel, cad plated, No.4-40 by ¼ in.lg .	C	1
-23	1866K64P001	. . BUSHING	C	4
-24	5700K40G700	. PLATE ASSEMBLY		1
	1866K64P001	. . BUSHING		2
	1400K40P001	. . BEARING		1
	5438K60P008	. . NUT, Clinch		2
-25	2817K47P001	. COVER.		1
-26	NBSME05004	. SCREW, Slotted,fillister hd, brass, 0.0002 in. ni plated, No. 2-56 by ¼ in. lg.		2
-27	1199K40G700	. ARM ASSEMBLY . . . . . (Attaching Parts)		1
-28	NKJCT09002	. . SCREW, Hex socket, cup point, steel, cad plated, No.4-40 by 1/8 in.lg ---*---		2
-29	9010K40G700	. WIPER ASSEMBLY		1
-30	6170K62G700	. RESISTANCE SLIDEWIRE ASSEMBLY. . . . . (Attaching Parts)		1
-31	NBCEM09004	. SCREW, Cap,button hd,hex socket, steel, cad plated, No.4-40 by 1/4 in.lg. . ---*---		3
-32	NKJCT09004	. SCREW, Hex socket,cup point, steel,cad plated, No.4-40 by ¼ in. lg		2
-33	5817K41G700	. POST ASSEMBLY.		1
	NRGED13008	. . PIN,Dowel,steel,cad plated,No. 1/8 by ½ in. lg.		1
-34	7581K40P001	. SHIM		1
-35	NBZAM05007	. SCREW, Slotted,pan hd,steel, cad,plated, No. 2-56 by 7/16 in. lg	L	2
	NBZAM05015	. SCREW, Slotted,pan hd,steel,cad,plated, No. 2-56 by 7/16 in. lg	M	2
-36	NTMPE08000	. LOCKWASHER, Internal tooth, phosphor bronze,0.0002 in. ni plated, No.2 .	N	2
-37	1013K60P001	. ACTUATOR, Switch	M	1
-38	11SM1-T	. SWITCH, Push, (△8155K40P001)(V91929).	M	1
-39	7834K40P002	. SPACER	M	2
-40	1013K60P001	. ACTUATOR, Switch	N	1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
8-1-41	11SM1-T	SWITCH, Push(△8155K40P001)(V91929). .	N	1
-42	7834K40P001	SPACER	N	2
-43	7671K41P003	SLEEVE		1
-44	NTYCM00025	RING, Retaining, open.		2
-45	1999K40P001	CAM.		2
-46	6288K40P001	RING, Retaining.		2
-47	NBBED06003	SCREW, Cap, fillister hd, hex socket, steel,cad plated,No.3-56 by 3/16 in. lg.		1
-48	2341K53P001	CLAMP.		1
-49	NTYCM00025	RING, Retaining, open.		1
-50	7581K40P002	SHIM		1
-51	NKJCT09006	SCREW, Hex socket, cup point, steel, cad plated,No.4-40 by 3/8 in.lg . .		2
-52	7489K60G700	SHEAVE ASSEMBLY.		1
-53	3899K40P020	GEAR		1
-54	5721K63G700	PLATE ASSEMBLY		1
-55	NKJCT13004	SCREW,Hex socket,cup point,steel,cad plated,No. 6-32 by ¼ in. lg		1
-56	8912K63P001	WASHER, Spring		1
-57	4381K61P001	HUB.		1
-58	NTYCM00025	RING, Retaining, open.		1
-59	2817K47P001	COVER.	P	1
-60	NBSME05004	SCREW,Slotted,fillister hd,brass,0.0002 in.ni plated, No.2-56 by ¼ in.lg. .	P	2
-61	1199K40G700	ARM ASSEMBLY	P	1
		(Attaching Parts)		
-62	NKJCT09002	. SCREW,Hex socket,cup point,steel, cad plated,No.4-40 by 1/8 in.lg. ---*---	P	2
-63	9010K40G701	WIPER ASSEMBLY	P	1
-64	6170K62G703	RESISTANCE SLIDEWIRE ASSEMBLY.	P	1
		(Attaching Parts)		
-65	NBZME09004	SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No.4-40 by ¼ in.lg. . . .	P	3
-66	NBBED06003	SCREW, Cap,fillister hd, hex socket, steel, cad plated, No.3-56 by 3/16 in. lg.	B	1
-67	2341K53P001	CLAMP.	B	1
-68	NKJCT09006	SCREW,Hex socket,cup point,steel, cad plated,No.4-40 by 3/8 in.lg	B	2
-69	7486K41P001	SHEAVE	B	1
-70	7581K40P001	SHIM	B	1
-71	7413K40P001	SHAFT.		1

SECTION IX
ELEMENT ASSEMBLY
P/N 3378K40

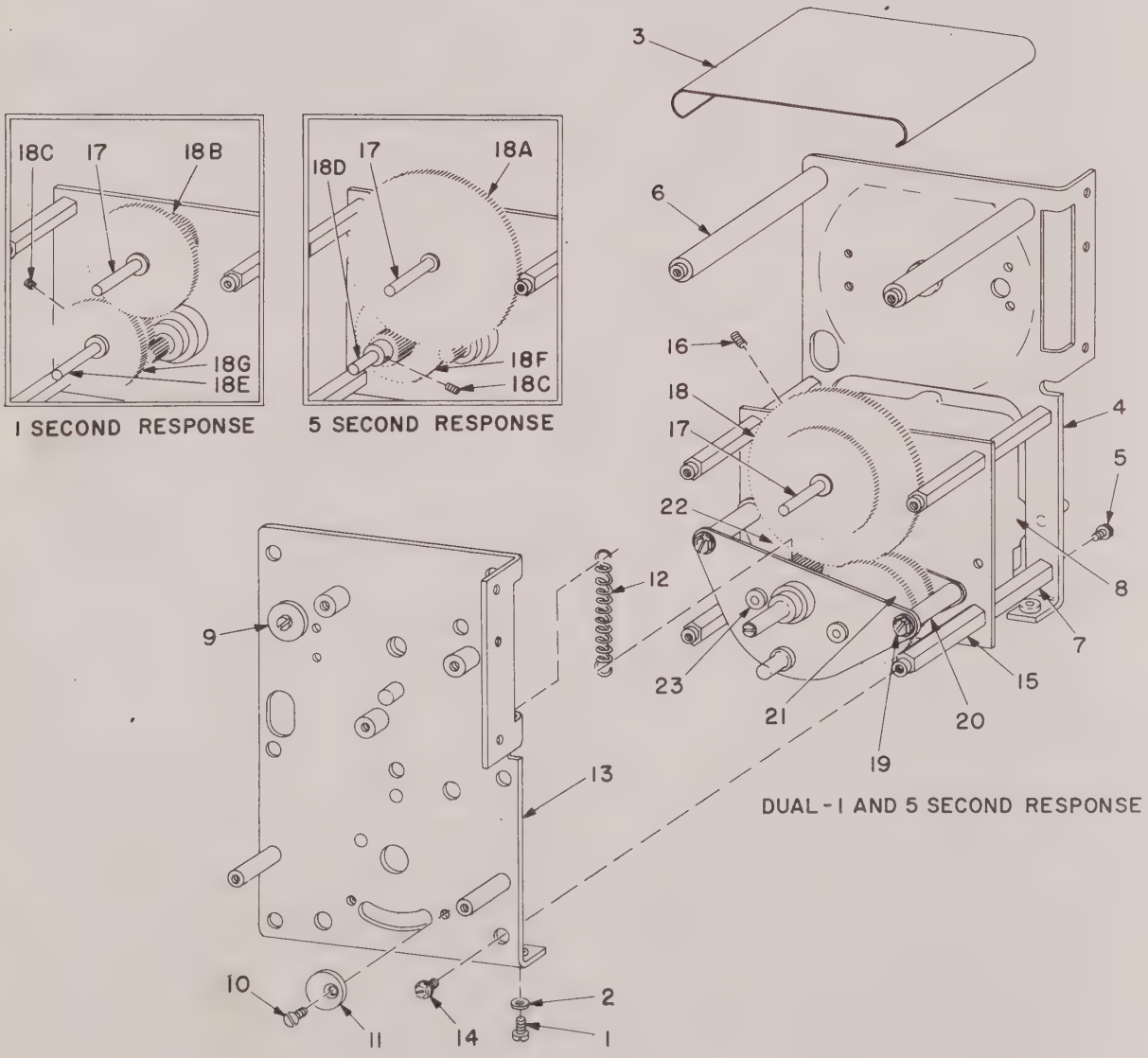


Figure 9-1. (Sheet 1) Element Assembly, P/N 3378K40

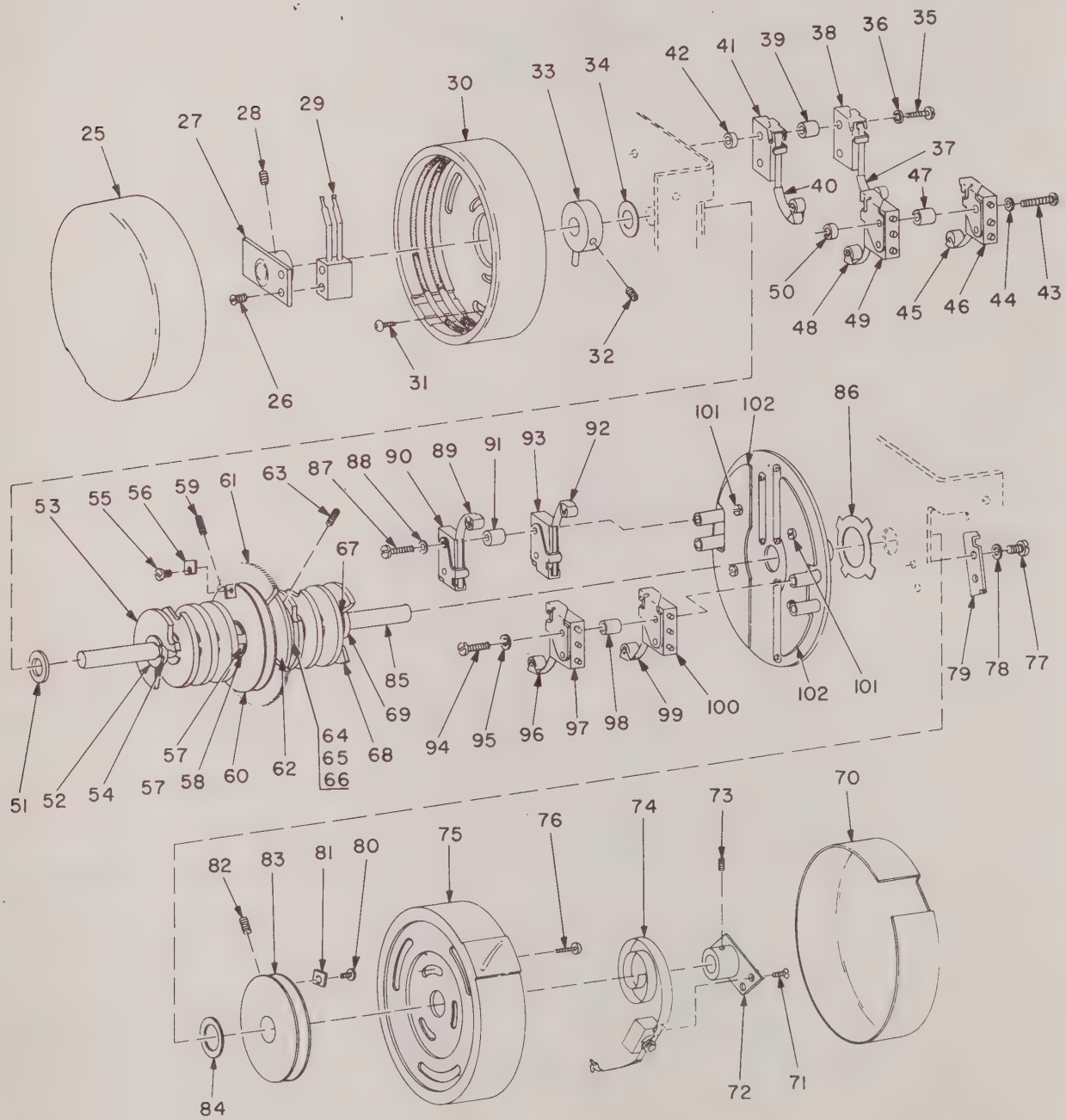


Figure 9-1. (Sheet 2) Element Assembly, P/N 3378K40

This section contains a Group Assembly Parts List for Element Assembly 3378K40, Groups G700 thru G810, for Miniature Recorder Types 520 and 521. The group number of your particular element assembly is stamped on its side.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code column, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability List

		Letter																				
3378K40	No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y
G700	0	X			X			X															
701	1	X			X			X	X														
702	2	X			X			X		X													
703	3	X			X			X		X	X												
704	4	X			X			X		X		X											
705	5	X			X			X							X								
706	6	X			X			X	X						X								
707	7	X			X			X		X					X								
708	8	X			X			X		X	X				X								
709	9				X			X					X			X								
710	10				X			X	X				X			X								
711	11				X			X		X			X			X								
712	12				X			X		X	X		X			X								
713	13				X			X					X				X						X	
714	14				X			X	X				X				X						X	
715	15				X			X		X			X				X						X	
716	16				X			X					X							X	X	X		
717	17				X			X	X				X							X	X	X		
718	18				X			X					X								X	X		
719	19				X			X						X				X						
720	20				X			X	X					X				X						
721	21				X			X		X				X				X						
722	22				X			X		X	X			X				X						
723	23				X			X						X					X					
724	24				X			X	X					X					X					
725	25				X			X		X				X					X					
726	26				X			X						X										X
727	27				X			X	X					X										X
728	28					X		X																
729	29					X		X	X															
730	30					X		X		X														
731	31					X		X		X	X													
732	32					X		X		X		X												
733	33					X		X							X									
734	34					X		X	X						X									
735	35					X		X		X					X									
736	36					X		X		X	X				X									
737	37	X			X		X																	
738	38	X			X		X		X															
739	39	X			X		X			X														

Usage Code Applicability List (Cont.)

3378K40	No. → Letter	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y
740	40	X			X		X			X	X												
741	41	X			X		X			X		X											
742	42	X			X		X								X								
743	43	X			X		X		X						X								
744	44	X			X		X			X					X								
745	45	X			X		X			X	X				X								
746	46				X		X						X			X							
747	47				X		X		X				X			X							
748	48				X		X			X			X			X							
749	49				X		X			X	X		X			X							
G750	50				X		X						X				X					X	
751	51				X		X		X				X				X					X	
752	52				X		X			X			X				X					X	
753	53				X		X						X							X	X	X	
754	54				X		X		X				X							X	X	X	
755	55				X		X						X								X	X	
756	56				X		X							X				X					
757	57				X		X		X					X				X					
758	58				X		X			X				X				X					
759	59				X		X			X	X			X				X					
760	60				X		X							X					X				
761	61				X		X		X					X					X				
762	62				X		X			X				X					X				
763	63				X		X							X									X
764	64				X		X							X									X
765	65					X	X																
766	66					X	X		X														
767	67					X	X			X													
768	68					X	X			X	X												
769	69					X	X			X		X											
770	70					X	X								X								
771	71					X	X		X						X								
772	72					X	X			X					X								
773	73					X	X			X	X				X								
774	74	X	X																				
775	75	X	X						X														
776	76	X	X							X													
777	77	X	X							X	X												
778	78	X	X							X		X											
779	79	X	X												X								
780	80	X	X						X						X								
781	81	X	X							X					X								
782	82	X	X							X	X				X								
783	83		X										X			X							
784	84		X						X				X			X							
785	85		X							X			X			X							
786	86		X							X	X		X			X							
787	87		X										X				X					X	
788	88		X						X				X				X					X	
789	89		X							X			X				X					X	

Usage Code Applicability (Cont.)

3378K40	No. (→ Letter)	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y
790	90		X										X							X	X	X	
791	91		X						X				X							X	X	X	
792	92		X										X								X	X	
793	93		X											X				X					
794	94		X						X					X				X					
795	95		X							X				X				X					
796	96		X							X	X			X				X					
797	97		X											X					X				
798	98		X						X					X					X				
799	99		X							X				X					X				
800	100		X											X									X
801	101		X						X					X									X
802	102			X																			
803	103			X					X														
804	104			X						X													
805	105			X						X	X												
806	106			X						X		X											
807	107			X											X								
808	108			X					X						X								
809	109			X						X					X								
810	110			X						X	X				X								

PARTS LIST

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
9-1-	3378K40	ELEMENT ASSEMBLY		Ref
		(Attaching Parts)		
-1	NBZME13004	SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No.6-32 by ¼ in.lg		4
-2	NTMPE13000	LOCKWASHER,Internal tooth,phosphor bronze, 0.0002 in.ni plated, No.6.		4
		---*---		
-3	5681K45P001	. PLATE, Cover		1
-4	5700K42G701	. PLATE ASSEMBLY, Right.	A	1
	5700K42G702	. PLATE ASSEMBLY, Right.	M,V	1
	5700K42G704	. PLATE ASSEMBLY, Right.	C,E	1
		(Attaching Parts)		
-5	NBLAE13004	. SCREW, Hex, washer hd,steel,ni plated, No. 6-32 by ¼ in.lg		6
		---*---		
--	1866K64P002	. . BUSHING		1
--	5438K60P001	. . NUT, Clinch	M,N	5
--	5438K60P001	. . NUT, Clinch	A	2
-6	5809K43P005	. POST		2
-7	5809K42P003	. POST		4
-8	5360K61G700	. MOTOR ASSEMBLY		1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
		(Attaching Parts)		
9-1-8	COML	. . SCREW,Machine, fillister hd, No.8-32 by 1 3/4 in. lg.		2
		---*---		
-9	NBZME06005	. SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No.3-56 by 5/16 in.lg . .	A,R, S,V	1
	7486K60P002	. PULLEY	A,R, S,V	1
	7834K40P004	. SPACER	A,R, S,V	1
-10	NBSME13004	. SCREW,Slotted,fillister hd,brass,0.0002 in.ni plated,No.6-32 by 1/4 in.lg .	B,C	2
-11	8900K43P001	. WASHER	B,C	2
-12	7923K47P001	. SPRING	B,C	1
-13	5700K41G700	. PLATE ASSEMBLY, Left	D	1
	5700K41G701	. PLATE ASSEMBLY, Left	E	1
	5700K41G702	. PLATE ASSEMBLY, Left	B	1
	5700K41G703	. PLATE ASSEMBLY, Left	C	1
		(Attaching Parts)		
-14	NBLAE13004	. SCREW,Hex,washer hd,steel, ni plated, No. 6-32 by ¼ in.lg		6
		---*---		
--	1866K64P001	. . BUSHING	B	1
--	1866K64P001	. . BUSHING	D,E	2
--	1866K64P002	. . BUSHING		1
--	5438K60P001	. . NUT, Clinch	E	2
--	5438K60P001	. . NUT, Clinch	C	4
--	5438K60P001	. . NUT, Clinch	D	5
--	5438K60P001	. . NUT, Clinch	B	7
-15	5809K42P002	. POST		4
-16	NKJCT09004	. SCREW,Hex socket, cup point, steel,cad plated, No.4-40 by ¼ in.lg.		1
-17	7413K41P001	. SHAFT.		1
-18	3867K43G700	. GEAR AND HUB ASSEMBLY.	B,C	1
-18A	3867K43G701	. GEAR AND HUB ASSEMBLY.	F	1
-18B	3867K43G702	. GEAR AND HUB ASSEMBLY.	G	1
-18C	NKJCT09002	. SCREW, Hex socket,cup point,steel,cad plated, No.4-40 by 1/8 in.lg. . . .	F,G	1
-18D	7413K41P005	. SHAFT.	F	1
-18E	7413K41P004	. SHAFT.	G	1
-18F	3868K40G700	. GEAR AND PINION ASSEMBLY	F	1
-18G	3867K44G700	. GEAR AND HUB ASSEMBLY.	G	1
--	3869K40G700	. GEAR AND POST ASSEMBLY	B,C	1
-19	NBLAE13004	. . SCREW,Hex,washer hd,steel,ni plated, No. 6-32 by ¼ in.lg.	B,C	5
-20	8072K40P001	. . STUD.	B,C	2
-21	3867K44G700	. . GEAR AND HUB ASSEMBLY	B,C	1
	7413K41P001	. . SHAFT	B,C	1
	NKJCT09002	. . SCREW,Hex socket,cup point, steel, cad plated,No.4-40 by 1/8 in.lg.	B,C	1
-22	3868K40G700	. . GEAR AND PINION ASSEMBLY.	B,C	1
	7413K41P003	. . SHAFT	B,C	1
	NKJCT09002	. . SCREW,Hex socket,cup point,steel, cad plated,No.4-40 by 1/8 in.lg.	B,C	1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
9-1-23	1866K64P001	. . BUSHING	B,C	4
-24	5700K40G700	. PLATE ASSEMBLY		1
	1866K64P001	. . BUSHING		2
	1400K40P001	. . BEARING		1
	5438K60P008	. . NUT, Clinch		2
-25	2817K47P001	. COVER		1
-26	NBSME05004	. SCREW,Slotted, fillister hd,brass, 0.0002 in.ni plated,No.2-56 by ¼ in. lg.		2
-27	1199K40G700	. ARM ASSEMBLY (Attaching Parts)		1
-28	NKJCT09002	. . SCREW, Hex socket,cup point,steel, cad plated,No.4-40 by 1/8 in.lg. ---*---		2
-29	9010K40G700	. WIPER ASSEMBLY		1
-30	6170K62G700	. RESISTANCE SLIDEWIRE ASSEMBLY. (Attaching Parts)		1
-31	NBCEM09004	. SCREW,Cap,button hd,hex socket,steel, cad plated,No.4-40 by ¼ in.lg. ---*---		3
-32	NKJCT09004	. SCREW,Hex socket,cup point,steel, cad plated, No.4-40 by ¼ in.lg.		2
-33	5817K41G700	. POST ASSEMBLY.		1
	NRGED13008	. . PIN, Dowel, steel		1
-34	7581K40P001	. SHIM		1
-35	NBZAM05007	. SCREW,Slotted,pan hd,steel,cad plated, No. 2-56 by 7/16 in.lg.	H	2
	NBZAM05015	. SCREW,Slotted,pan hd,steel,cad plated, No. 2-56 by 15/16 in.lg	J	2
-36	NTMPE08000	. LOCKWASHER,Internal tooth,phosphor bronze,0.0002 in.ni plated,No.2	H,J	2
-37	1013K60P001	. ACTUATOR, Switch	J	1
-38	11SM1-T	. SWITCH, Push,No.2(△8155K40P001) (V91929).	J	1
-39	7834K40P002	. SPACER	J	2
-40	1013K60P001	. ACTUATOR, Switch	H,J	1
-41	11SM1-T	. SWITCH,Push,No.1 (△8155K40P001) (V91929).	H,J	1
-42	7834K40P001	. SPACER.	H,J	2
-43	NBZAM05011	. SCREW,Slotted,pan hd,steel,cad plated, No. 2-56 by 11/16 in.lg	K	2
	NBZAM05019	. SCREW,Slotted,pan hd,steel,cad plated, No. 2-56 by 1 3/16 in.lg.	L	2
-44	NTMPE08000	. LOCKWASHER,Internal tooth, phosphor bronze, 0.0002 in.ni plated,No.2.	K,L	2
-45	1013K60P001	. ACTUATOR, Switch	L	1
-46	11SM1-T	. SWITCH,Push,No.4 (△8155K40P001) (V91929).	L	1
-47	7834K40P002	. SPACER	L	2
-48	1013K60P001	. ACTUATOR, Switch	K,L	1
-49	11SM1-T	. SWITCH,Push, No.3 (△8155K40P001) (V91929).	K,L	1
-50	7834K40P003	. SPACER	K,L	2
-51	7671K41P003	. SLEEVE		1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
9-1-52	NTYCM00025	RING,Retaining, open		4
-53	1999K40P001	CAM.		4
-54	6288K40P001	RING,Retaining		4
-55	NBBED06003	SCREW,Cap,fillister hd,hex socket,steel, cad plated, No.3-56 by 3/16 in.lg		1
-56	2341K53P001	CLAMP.		1
-57	NTYCM00025	RING, Retaining, open.		1
-58	7581K40P002	SHIM		1
-59	NKJCT09006	SCREW,Hex socket,cup point,steel, cad plated, No.4-40 by 3/8 in.lg.		2
-60	7489K60G700	SHEAVE ASSEMBLY.		1
-61	3899K40P020	GEAR		1
-62	5721K63G700	PLATE ASSEMBLY		1
-63	NKJCT13004	SCREW,Hex socket,cup point,steel, cad plated,No. 6-32 by 1 in.lg.		1
-64	8912K63P001	WASHER, Spring		1
-65	4381K61P001	HUB.		1
-66	NTYCM00025	RING, Retaining, open.		1
-67	NTYCM00025	RING, Retaining, open.	M,N	4
-68	1999K40P001	CAM.	M,N	4
-69	6288K40P001	RING, Retaining.	M,N	4
-70	2817K47P001	COVER.	A,C,E	1
	2817K47P002	COVER.	A,C,E	1
-71	NBSME05004	SCREW,Slotted,fillister hd,brass,0.0002 in.ni plated,No. 2-56 by ¼ in.lg.	M,N	2
-72	1199K40G700	ARM ASSEMBLY (Attaching Parts)	P,N	1
-73	NKJCT09002	SCREW,Hex socket,cup point,steel, cad plated,No.4-40 by 1/8 in.lg	P,N	2
		---*---		
-74	9010K40G701	WIPER ASSEMBLY	P	1
	9010K40G702	WIPER ASSEMBLY	N	1
-75	6170K62G703	RESISTANCE SLIDEWIRE ASSEMBLY.	P	1
	6170K40G702	RESISTANCE SLIDEWIRE ASSEMBLY.	N	1
--	4320K42P002	HOUSING. (Attaching Parts)	M	1
-76	NBZME09004	SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No. 4-40 by ¼ in.lg	P	3
	NBZME06002	SCREW,Slotted, pan hd,brass,0.0002 in. ni plated, No.3-56 by 1/8 in.lg	M,N	3
		---*---		
-77	NBZME06002	SCREW,Slotted,pan hd,brass,0.0002 in. ni plated,No.3-56 by 1/8 in.lg.	M,N	2
-78	NTMPE09000	LOCKWASHER,Internal tooth, phosphor bronze,0.0002 in.ni plated, No.3.	M,N	2
-79	8037K60P001	STOP	M,N	1
-80	NBBED06003	SCREW,Cap,fillister hd,hex socket, steel,cad plated,No.3-56 by 3/16 in. lg.	C,E, M,N	1
-81	2341K53P001	CLAMP.	C,E, M,N	1
-82	NKJCT09006	SCREW,Hex socket, cup point,steel,cad plated,No. 4-40 by 3/8 in.lg.	C,E, M,N	2

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
9-1-83	7486K41P001	. SHEAVE	C,E	1
	7489K60G701	. SHEAVE ASSEMBLY	M,N	1
-84	7581K40P001	. SHIM	C,E	1
-85	7413K40P001	. SHAFT		1
-86	8912K40P001	. WASHER,Spring	M,N	1
--	6620K40G700	. FRONT SET ASSEMBLY	R	1
	6620K40G701	. FRONT SET ASSEMBLY	S	1
	6620K40G702	. FRONT SET ASSEMBLY	16,53,90	1
	6620K40G703	. FRONT SET ASSEMBLY	17,54,91	1
	6620K40G704	. FRONT SET ASSEMBLY	18,55,92	1
	6620K40G705	. FRONT SET ASSEMBLY	T	1
	6620K40G706	. FRONT SET ASSEMBLY	U	1
	6620K40G707	. FRONT SET ASSEMBLY	22,63,100	1
	6620K40G708	. FRONT SET ASSEMBLY	27,64,101	1
-87	NBZAM05015	. SCREW,Slotted,pan hd,steel,cad plated, No. 2-56 by 15/16 in.lg	18,55,92	2
	NBZAM05007	. SCREW,Slotted,pan hd,steel,cad plated, No. 2-56 by 15/16 in.lg	V	2
-88	NTMPE08000	. LOCKWASHER,Internal tooth,phosphor bronze,0.0002 in.ni plated, No.2.	W	2
-89	1013K60P001	. ACTUATOR, Switch	18,55,92	1
-90	11SM1-T	. SWITCH, Push,No.8 (△8155K40P001) (V91929)	18,55,92	1
-91	7834K40P002	. SPACER	18,55,92	2
-92	1013K60P001	. ACTUATOR, Switch	W	1
-93	11SM1-T	. SWITCH,Push,No.7(△8155K40P001)(V91929)	W	1
-94	NBZAM05015	. SCREW,Slotted,pan hd,steel,cad plated, No. 2-56 by 15/16 in.lg	X,Y	2
	NBZAM05007	. SCREW,Slotted,pan hd,steel,cad plated, No. 2-56 by 7/16 in.lg.	R,U	2
-95	NTMPE08000	. LOCKWASHER,Internal tooth, phosphor bronze, 0.0002 in.ni plated,No.2.	N,U,Y	2
-96	1013K60P001	. ACTUATOR, Switch	X,Y	1
-97	11SM1-T	. SWITCH, Push, No. 6 (△8155K40P001) (V91929).	X,Y	1
-98	7834K40P002	. SPACER	X,Y	2
-99	1013K60P001	. ACTUATOR, Switch	R,U, X,Y	1
-100	11SM1-T	. SWITCH, Push, No. 5 (△8155K40P001) (V91929).	R,U, X,Y	1
-101	NBZME05002	. SCREW,Slotted, pan hd,brass,0.0002 in. ni plated,No. 2-56 by 1/8 in.lg	M,N	4
-102	2817K60P001	. COVER.	M,N	2

SECTION X
BASE PLATE ASSEMBLY
P/N 5700K47 and BASE ASSEMBLY
P/N 1361K41

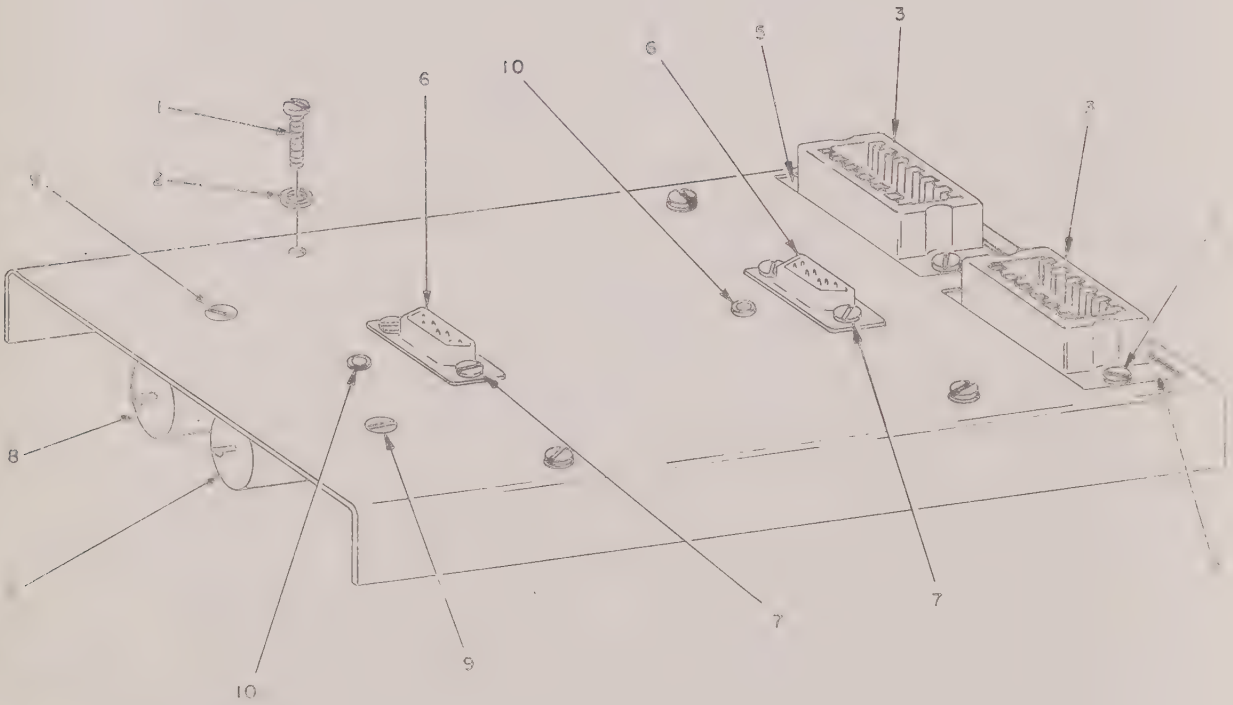


Figure 10-1. Base Plate Assembly

This section contains two Group Assembly Parts Lists: one list for Base Plate Assembly 5700K47; and one list for Base Assembly 1361K41.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code column of either list, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability List
(For P/N's 5700K47 and 1361K41)

Recorder	A	B
Types 521 and 531	X	
Types 520 and 530		X

PARTS LIST

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
10-1-	5700K47	BASE PLATE ASSEMBLY		Ref
		(Attaching Parts)		
-1	NBZME13014	SCREW, Slotted, pan hd, brass, 0.0002 in. ni plated, No. 6-32 by 7/8 in. lg. . .	A	4
	NBZME13014	SCREW, Slotted, pan hd, brass, 0.0002 in. ni plated, No. 6-32 by 7/8 in. lg. . .	B	2
-2	NTMPE13000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in. ni plated, No.6 . .	A	4
	NTMPE13000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in. ni plated, No.6 . .	B	2
		---*---		
-3	26-4200-16S	. CONNECTOR, 16 contacts (△2603K40P103) (V02660).	A	2
	26-4200-16S	. CONNECTOR, 16 contacts (△2603K40P103) (V02660).	B	1
		(Attaching Parts)		
-4	NBZME09005	. SCREW, Slotted, pan hd, brass,0.0002 in. ni plated, No.4-40 by 5/16 in. lg .	A	4
	NBZME09005	. SCREW, Slotted, pan hd,brass,0.0002 in. ni plated, No.4-40 by 5/16 in. lg .	B	2
	NTMPE11000	. LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated,No.4. .	A	2
	NTMPE11000	. LOCKWASHER, Internal tooth, phosphor bronze,0.0002 in.ni plated, No.4. .	B	1
	8311K42P001	. TERMINAL, Locking.	A	2
	8311K42P001	. TERMINAL, Locking.	B	1

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
10-1-4	NLMME09000	NUT, Hex,brass,0.0002 in. ni plated, No. 4-40.	A	4
	NLMME09000	NUT, Hex,brass,0.0002 in. ni plated, No. 4-40.	B	2
		---*---		
-5	5698K60P001	PLATE, Back.	A	2
	5698K60P001	PLATE, Back.	B	1
-6	DA15S	CONNECTOR, Plug, 15 pin(△5730K90P004) (V91146).	A	2
	DA15S	CONNECTOR, Plug, 15 pin(△5730K90P004) (V91146).	B	1
		(Attaching Parts)		
-7	NBZME09004	SCREW, Slotted,pan hd, brass,0.0002 in. ni plated, No.4-40 by ¼ in. lg. . .	A	4
	NBZME09004	SCREW, Slotted,pan hd, brass,0.0002 in. ni plated, No.4-40 by ¼ in. lg. . .	B	2
	NTMPE11000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated,No.4. .	A	4
	NTMPE11000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated,No.4. .	B	2
	8311K42P001	TERMINAL, Locking.	A	4
	8311K42P001	TERMINAL, Locking.	B	2
	NLMME09000	NUT, Hex,brass,0.0002 in.ni plated, No. 4-40.	A	4
	NLMME09000	NUT, Hex,brass,0.0002 in. ni plated, No. 4-40.	B	2
		---*---		
-8	118P68496T	CAPACITOR, Metalized paper, 0.68 mfd ± 10%, 600 VDC,(△2095K90P150) (V56289) (C16).	A	2
	118P68496T	CAPACITOR, Metalized paper, 0.68 mfd ± 10%, 600 VDC,(△2095K90P150) (V56289) (C16).	B	1
		(Attaching Parts)		
-9	NBSME09004	SCREW, Slotted,fillister hd, brass, 0.0002 in.ni plated, No.4-40 by ¼ in. lg.	A	2
	NBSME09004	SCREW, Slotted,fillister hd, brass, 0.0002 in.ni plated, No. 4-40 by ¼ in. lg.	B	1
	NTMPE11000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in.ni plated, No.4 .	A	2
	NTMPE11000	LOCKWASHER, Internal tooth, phosphor bronze, 0.0002 in. ni plated, No.4.	B	1
	NLMME0900	NUT, Hex,brass, 0.0002 in.ni plated, No. 4-40.	A	2
	NLMME0900	NUT, Hex,brass,0.0002 in.ni plated, No. 4-40.	B	1
		---*---		
-10	5438K60P010	NUT, Clinch.	A	2
	5438K60P010	NUT, Clinch.	B	1

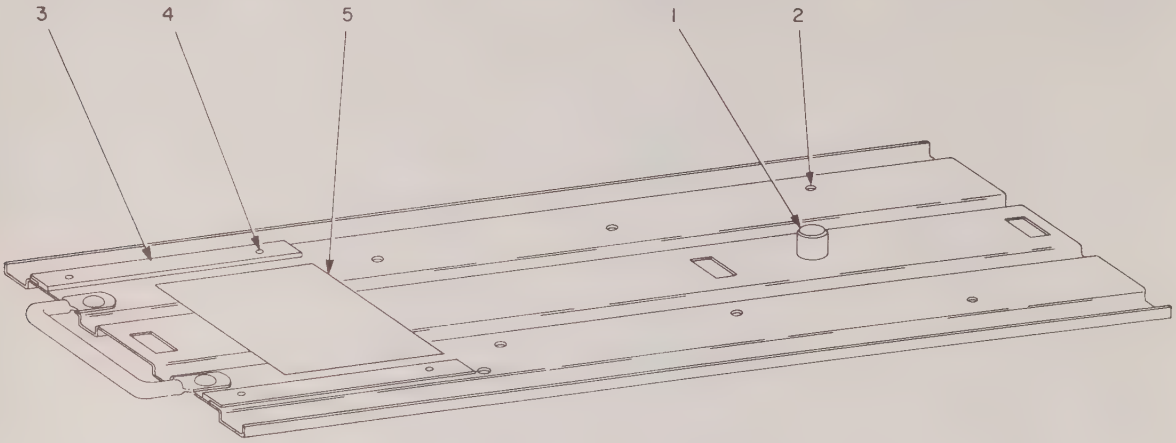


Figure 10-2. Base Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
10-2-	1361K41	BASE ASSEMBLY		Ref
-1	5438K60P101	. NUT, Clinch.		1
-2	5438K60P001	. NUT, Clinch.	A	4
	5438K60P001	. NUT, Clinch.	B	2
-3	4068K40P001	. GUIDE.		2
		(Attaching Parts)		
-4	NBZME13004	. SCREW, Slotted,pan hd,brass,0.0002 in. ni plated,No.6-32 by ¼ in. lg . . .		4
		---*---		
-5	5689K62P001	. PLATE, Rating.	B	1
	5689K62P002	. PLATE, Rating.	A	1

SECTION XI
ACCESSORIES

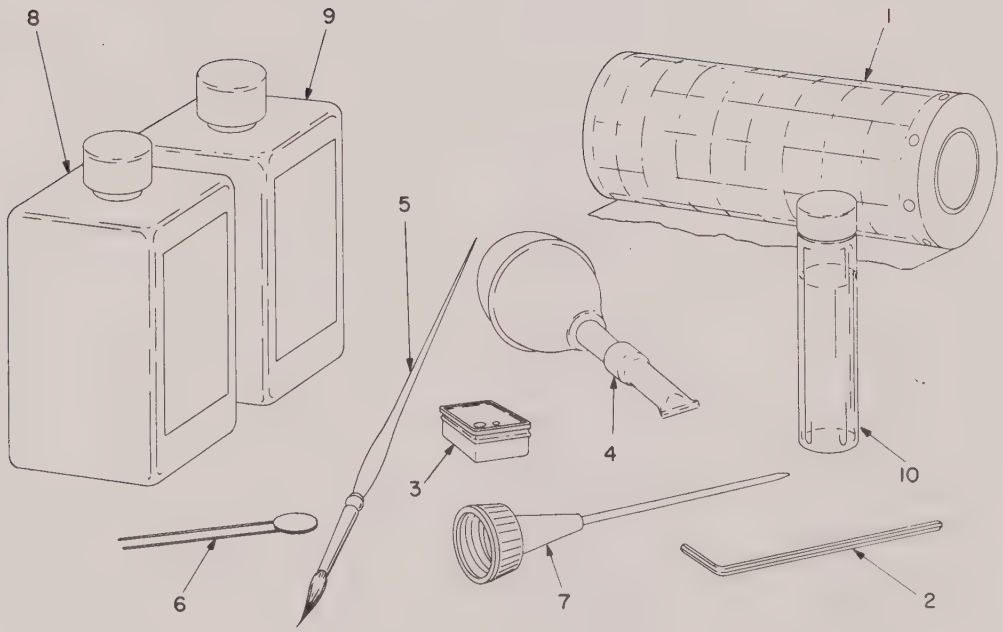


Figure 11-1. Accessories

This section contains a Group Assembly Parts List for Accessories 1012K60.

To identify a component, locate the component on an illustration and note its item number. Then, find the item number in the parts list to determine the part number and description. If a code symbol is found in the Usage Code column, note the code and check it against the Usage Code Applicability List to determine which part number is applicable.

Usage Code Applicability

Recorder	A	B
Types 520 and 530	X	
Types 521 and 531		X

PARTS LIST

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	USAGE CODE	UNITS PER ASSY
11-1-	1012K60	ACCESSORIES		Ref
-1	**6050K60P---	. CHART.		1
-2	9087K43P003	. WRENCH, Allen, 0.050 in.		1
	9087K43P004	. WRENCH, Allen, 1/16 in.	A	1
-3	4496K60G700	. INKWELL ASSEMBLY		2
-4	1834K61G701	. BULB ASSEMBLY.		1
-5	1822K90P001	. BRUSH.		1
-6	2366K60G700	. PEN CLEANER ASSEMBLY		1
-7	2060K60G700	. CAP ASSEMBLY		1
-8	1656K60G700	. INK, Red	B	1
	1656K60G721	. INK, Red, slow drying.	B	1
-9	1656K60G705	. INK, Black		1
	1656K60G723	. INK, Black, slow drying.		1
-10	CSJYA80055	. CRAMOLIN		1

** See actual part for complete part number.

SECTION XII
NUMERICAL INDEX

PART NO.	FIG. & INDEX NO.	QTY PER INSTRUMENT
AE7929	2-1-17	1
BRACKET	1-1-5	1
CB-100	6-2-3	1
CQT831	2-3-3	2
CSJYA80055	11-1-10	1
DA15P	1-1--	1
DA15S	10-1-6	2
DAS-1-2700	6-2-5	1
EB-1035	1-2-3	22
	1-2--	
	2-2-12	
EB-1055	1-2-38	1
EB-1065	1-2-39	1
EB-1525	2-2-15	1
EB-2025	1-2-16	1
EB-2035	1-2-11	1
EB-2235	2-2-13	1
EB-2445	1-2-37	1
EB-3025	1-2-31	3
EB-3325	2-1-13	1
EB-3935	1-2-10	2
EB-4715	1-2-15	3
EB-5115	2-1-10	2
EB-5135	2-1-22	1
EB-5155	1-2-38	1
EB-5625	2-2-16	1
EB-5655	6-2-4	1
EB-7535	1-2-1	2
IN645	1-2-19	12
	2-2-11	
	6-2-2	
IN758	6-2-7	1
IN961	1-2-7	2
LOCKWASHER	3-1-19	2
M-860	2-1-6	1
MMC-1854	1-2-20	1
MMC-1875	1-2-34	1
N4	2-2-7	1
N4-B	1-2-21	2
	6-2-7	
NBBED06003	8-1-47	2
NBCED13004	3-1-1	4
NBCEM09004	8-1-31	3
NBLAE13004	4-1-2	18
NBSME05004	8-1-26	4
NBSME09004	1-1-6	6
NBSME09008	2-1-9	2
NBSME13004	8-1-10	2
NBTAC09003	5-1-48	1
NBTME06003	5-1-43	2
NBZAM05007	8-1-35	6
NBZAM05011	9-1-43	2
NBZAM05015	8-1-35	6
NBZAM05019	9-1-43	2
NBZAM17074	1-1-2	1
NBZME03005	6-1-5A	1
NBZME05002	9-1-101	4
NBZME05004	6-2-1	3
NBZME05007	3-1-13	2
NBZME06002	3-1-9	11
NBZME06005	8-1-9	1
NBZME09002	3-1-21	4
NBZME09003	4-1-11	16
NBZME09004	1-1--	14
NBZME09005	6-3-4	6
NBZME09008	7-1-4	2
NBZME09009	5-1-34	2
NBZME13003	2-1-21	6
NBZME13004	1-1-3	19
NBZME13007	2-3-4	2
NBZME13014	10-1-1	4
NBZME15006	4-1-6	1
NBZME16003	4-1-9	1
NBZME17074	2-1-1	1
NGNAC09004	1-2-12	2
NKJCR09002	4-1-44	2
NKJCT09002	4-1-36	8
NKJCT09004	8-1-16	3
NKJCT09006	8-1-51	4
NKJCT13004	8-1-55	1
NKLME13003	1-1-7	2
NLMME0900	10-1-9	2
NLMME09000	10-1-4	8
NLMNE09	2-1-16	2

PART NO.	FIG. & INDEX NO.	QTY PER INSTRUMENT
NLMNE09000	1-1--	5
NLMNE13000	2-3-4	2
NLMNE15000	4-1-4	1
NLNME09	1-1-6	2
NPMMR12008	6-1-4	4
NRGED13008	8-1-33	1
NTAME05000	6-1-5	2
NTAME07000	2-3-4	2
NTLPE13000	3-1-6	2
NTMPE09000	5-1-44	6
NTMPE08000	8-1-36	8
NTMPE1100	1-1--	1
NTMPE11000	1-1-6	34
NTMPE1300	3-1-2	4
NTMPE13000	2-1-21	16
NTMPE16000	4-1-5	1
NTYCC00012	5-1-42	1
NTYCM00007	3-1-6	32
NTYCM00012	3-1-30	2
NTYCM00025	8-1-44	10
R1391	1-2-25	2
R1391-60K	6-2-4	1
R1375-70	1-2-22	2
R1375-500	1-2-27	1
R1375-2700	1-2-23	1
R1375-3308.34	1-2-26	1
R1375-91.680	1-2-29	1
S-153-125	6-1-4	1
SCREW	8-1-8	4
SKT-8	6-1-7	5
SS-31	4-1-10	1
SS-37	4-1-10	2
ST-SM-36TOR	2-3-2	2
VCSE-600	6-2-5	1
1012K60	11-1-	1
BOARD	6-1-10	1
1013K60P001	8-1-37	10
	8-1-40	
	9-1-37	
	9-1-40	
	9-1-45	
	9-1-48	
	9-1-89	
	9-1-92	
	9-1-96	
	9-1-99	
105-771	2-1-17	1
1096K40	2-1-	1
11SM1-T	8-1-38	10
	8-1-41	
	9-1-38	
	9-1-41	
	9-1-46	
	9-1-49	
	9-1-90	
	9-1-93	
	9-1-97	
	9-1-100	
111-51-01-062	1-2-30	1
117-200	6-3-3	1
117-1000	6-1-5	1
118P10594S13	2-1-14	1
118P68496T	10-1-8	2
1199K40G700	8-1-27	2
	8-1-61	
	9-1-27	
	9-1-72	
121-51-00-040	2-2-8	1
1361K41	10-2-	1
1400K40P001	8-1-24	1
	9-1-24	
150D-15	2-1-11	2
150D-47	1-2-32	2
150D685X9006A2	1-2-33	2
	2-1-12	
1561K40P026	7-1-3	2
1589K80	1-2-	1
1589K80G700	1-1-8	1
1589K80G701	1-1--	1
1589K80G702	1-1--	1
1589K80G703	1-1--	1
1589K80G705	1-1--	1
1597K42G700	2-1-7	1
1597K42G701	2-1--	1
1606K60	6-1	1
1606K61G700	6-3	1
1656K60G700	11-1-8	1
1656K60G705	11-1-9	1
1656K60G721	11-1-8	1
1656K60G723	11-1-9	1
1696K63P001	3-1-23	1
1696K63P002	3-1-22	1
1696K70P001	1-1--	1
1714K43	7-1	1
1714K62G700	3-1-4	1
1714K67G701	2-3-5	1
1822K90P001	11-1-5	1
1834K61G701	11-1-4	1
1866K64P001	8-1--	13
	8-1-23	
	9-1--	
	9-1-23	
1866K64P002	8-1--	2
1999K40P001	8-1-45	8
	9-1-53	
	9-1-68	
2049K42P001	2-1-5	1
2092K60P020	(See 54C23)	

PART NO.	FIG. & INDEX NO.	QTY PER INSTRUMENT
2092K60P021	(See 40C322)	
2092K90P003	(See 41C92)	
2092K90P075	(See 33C41)	
2095K90P128	(See 118P10594S13)	
2095K90P150	(See 118P68496T)	
2098K16P001	(See 30D-25)	
2098K60P002	(See 30D-20)	
2098K60P004	(See 30D-10)	
2098K60P011	(See 30D-2)	
2098K60P016	(See 30D-100)	
2098K92P029	(See 30D-500)	
2098K92P098	(See 30D-250)	
2098K92P137	(See 30D-1)	
2098K92P139	(See 30D-3)	
2098K92P151)	(See 30D-50)	
2060K60G700	11-1-7	1
2104-04-00	1-1--	1
2106-04-00	2-1-16	1
2106-06-00	2-1-21	1
2106K40P239	(See 150D685X900 6A2)	
2106K40P343	(See 150D-15)	
2106K92P073	(See 150D-47)	
2108K97P445	1-2-28	1
2143K60G700	4-1--	1
2143K60G701	4-1--	1
2143K60G702	4-1--	1
2143K60G703	4-1--	1
2143K60G704	4-1--	1
2143K60G705	4-1--	1
2143K60G706	4-1--	1
2143K60G708	4-1--	1
2143K60G709	4-1--	1
2143K60G710	4-1--	1
2145K40	5-1	1
2145K60	4-1	1
2146K40	3-1-	1
2150	2-3-4	1
2166K42P001	2-1-25	1
2166K68P001	1-1-9	1
2289K41G700	2-1--	1
2341K53P001	8-1-48	2
	8-1-67	
	9-1-56	
	9-1-81	
2341K60P001	3-1-21	2
2341K65P001	2-1-19	1
2343K11P018	4-1-7	1
	5-1-7	
2343K90P001	4-1-29	1
	5-1-30	
2366K60G700	11-1-6	1
2406-011	1-2-30	2
	2-1-18	
2506-06-00	2-3-4	1
26-4200-16S	10-1-3	2
2603K40P103	(See 26-4200-16S)	
2705K41P011	(See 2406-011)	
2817K41P001	4-1-18	1
	5-1-19	
2817K47P001	8-1-25	2
	8-1-59	
	9-1-25	
	9-1-70	
2817K47P002	9-1-70	1
2817K60P001	9-1-102	2
2827K41G700	2-1-4	1
2827K41G701	1-1-4	1
2N1926	2-2-6	1
2N2197	1-2-12	1
2N2714	1-2-35	1
2N3390	1-2-2	3
2N3405	1-2-13	1
2N3417	1-2-9	1
3015	4-1-31	2
	4-1-35	
	5-1-32	
	5-1-36	
30D-1	1-2-5	1
30D-2	2-2-9	1
30D-3	1-2-14	1
30D-10	1-2-4	3
30D-20	1-2-18	5
	2-2-10	
30D-25	2-2-14	3
30D-50	1-2-24	2
	6-2-8	
30D-100	1-2-6	2
30D-250	6-2-9	1
30D-500	2-2-2	3
312-64-1K	6-1-5A	1
3287K40G700	4-1-16	1
	5-1-17	
33C41	1-2-17	1
3378K40	9-1	1
3378K60	8-1	1
3867K40G700	5-1-47	1
3867K40G701	5-1-47	1
3867K40G703	5-1-47	1
3867K40G705	5-1-47	1
3867K40G706	4-1-43	2
	4-1-45	
3867K40G707	4-1-43	1
3867K40G708	4-1-43	1
3867K40G709	4-1-43	1
3867K40G710	4-1-43	2
	4-1-45	
3867K40G711	4-1-45	1

PART NO.	FIG. & INDEX NO.	QTY PER INSTRUMENT
3867K40G712	4-1-45	1
3867K40G713	4-1-45	1
3867K41G701	5-1-49	1
3867K41G702	5-1-49	1
3867K42G700	4-1-25	1
	5-1-26	
3867K43G700	8-1-18	1
	9-1-18	
3867K43G701	8-1-18A	1
	9-1-18A	
3867K43G702	8-1-18B	1
	9-1-18B	
3867K44G700	8-1-18G	2
	8-1-21	
	9-1-18G	
	9-1-21	
3867K60G700	4-1-42	1
3867K60G701	4-1-42	1
3867K60G702	4-1-42	1
3867K60G703	4-1-42	1
3867K60G704	4-1-42	1
3867K60G705	4-1-42	1
3867K60G706	4-1-42	1
3867K60G709	4-1-42	1
3899K41P001	5-1-46	1
3899K41P003	5-1-46	1
3899K40P020	9-1-61	1
3899K40P013	5-1-45	1
3899K40P015	5-1-45	1
3899K40P016	5-1-45	1
3899K40P020	8-1-53	1
3899K40P023	5-1-45	1
3869K40G700	8-1--	1
	9-1--	
3868K40G700	8-1-22	2
	8-1-18F	
	9-1-22	
	9-1-18F	
40C322	1-2-36	2
	2-2-21	
4029K10P008	(See 3015)	
4029K10P013	(See 614)	
4068K40P001	10-2-3	2
41C92	2-3-1	1
4225K40P001	4-1-22	1
	5-1-23	
4320K42P002	9-1--	1
4381K61P001	8-1-57	1
	9-1-65	
4390K40G700	4-1-27	1
	5-1-28	
44	1-2-8	1
44-250	2-2-3	1
4496K60G700	3-1-11	4
	3-1-17	
	11-1-3	
4594K60P002	(See 732)	
4643K40P041	2-2-5	1
4643K40P052	2-2-4	1
4643K41P011	(See SKT-8)	
4643K41P012	(See SKT-8)	
4643K41P013	(See SKT-8)	
4872K60G700	4-1-14	1
	5-1-15	
4872K60G701	4-1-15	1
	5-1-16	
4930K60P001	2-2-22	1
4945K60G700	2-1-24	2
4999K60G700	3-1-33	1
4999K60G701	3-1-33	1
5103-25	4-1-23	5
	4-1-28	
	4-1-32	
	5-1-24	
	5-1-29	
	5-1-33	
5133-12C	4-1-41	1
5360K60G700	5-1-38	1
5360K60G701	5-1-38	1
5360K60G702	4-1-34	1
	5-1-38	
5360K60G703	4-1-37	1
	5-1-38	
5360K60G704	5-1-35	1
5360K60G705	5-1-38	1
5360K60G706	4-1-34	2
	4-1-37	
5360K60G707	4-1-37	1
5360K60G708	4-1-37	1
5360K61G700	8-1-8	1
	9-1-8	
5360K63G700	4-1--	1
	5-1--	
5360K63G701	4-1--	1
54C23	2-2-18	1
5424K15P005	2-1-17	1
5427-3	2-1-2	1
5438K60P001	8-1--	16
	9-1--	
	10-2-2	
5438K60P005	4-1-11	11
	5-1-11	
5438K60P008	8-1-24	2
	9-1-24	
5438K60P010	10-1-10	2

PART NO.	FIG. & INDEX NO.	QTY PER INSTRUMENT
5438K60P101	4-1-9	3
	5-1-9	
	10-2-1	
5619K60G700	3-1-10	1
5619K60G701	3-1-16	1
5678K43P001	5-1-12	1
5678K43P003	5-1-12	1
5678K43P004	4-1-12	1
5678K43P006	4-1-12	1
5681K45P001	8-1-3	1
	9-1-3	
5689K62P001	10-2-5	1
5689K62P002	10-2-5	1
5698K60P001	10-1-5	2
5699K60P001	3-1-25	1
5699K60P002	3-1-34	1
5700K40G700	8-1-24	1
	9-1-24	
5700K41G700	8-1-13	1
	9-1-13	
5700K41G701	8-1-13	1
	9-1-13	
5700K41G702	8-1-13	1
	9-1-13	
5700K41G703	8-1-13	1
	9-1-13	
5700K42G701	8-1-4	1
	9-1-4	
5700K42G702	9-1-4	1
5700K42G704	8-1-4	1
	9-1-4	
5700K47	10-1-	1
5700K64G700	2-1-20	1
5712K60G700	4-1-40	1
	5-1-41	
5713K60G700	4-1--	1
	5-1--	
5713K60G701	4-1--	1
	5-1--	
5721K63G700	8-1-54	1
	9-1-62	
5721K65G700	4-1-31	1
	5-1-32	
5721K65G701	4-1-31	1
	5-1-32	
5721K65G702	4-1-35	1
	5-1-36	
5730K61P002	(See M-860)	
5730K90P003	(See DA15P)	
5730K90P004	(See DA15S)	
5734K60P011	(See 105-771)	
5779K41P001	3-1-7	1
5779K41P002	3-1-7	1
5809K42P002	8-1-15	4
	9-1-15	
5809K42P003	8-1-7	4
	9-1-7	
5809K43P001	4-1-26	2
	5-1-27	
5809K43P002	4-1-24	1
	5-1-25	
5809K43P003	3-1-26	1
5809K43P004	4-1-20	1
	5-1-21	1
5809K43P006	4-1-26	2
	5-1-27	
5809K43P005	8-1-6	2
	9-1-6	
5809K48P001	3-1-6	22
	3-1-18	
	3-1--	
5817K41G700	8-1-33	1
	9-1-33	
5839K45P001	(See 44-250)	
5839K45P101	(See 44)	
5840K43P102	(See 117-200)	
5840K43P103	(See 117-1000)	
5845K71P015	(See 312-64-1K)	
5897K40P001	3-1-6	22
	3-1-18	
	3-1--	
5976K60	6-1-3	1
6050K60P	11-1-1	1
6139K40G700	4-1-1	1
	5-1-1	
6143K12P061	(See EB-4715)	
6143K12P063	(See EB-5115)	
6143K12P079	(See EB-1525)	
6143K12P084	(See EB-2025)	
6143K12P090	(See EB-3025)	
6143K12P091	(See EB-3325)	
6143K12P100	(See EB-5625)	
6143K12P109	(See EB-1035)	
6143K12P120	(See EB-2035)	
6143K12P121	(See EB-2235)	
6143K12P130	(See EB-3935)	
6143K12P135	(See EB-5135)	
6143K12P141	(See EB-7535)	
6143K12P159	(See EB-2445)	
6143K12P181	(See EB-1055)	
6143K12P207	(See EB-5155)	
6143K12P210	(See EB-5655)	
6143K12P217	(See EB-1065)	
6143K25P053	(See CB-100)	
6143K60P001	2-2-17	1
6143K60P011	2-2-1	1
614	2-1-23	1

PART NO.	FIG. & INDEX NO.	QTY PER INSTRUMENT
6144K17P030	(See VCSE-600)	
6146K93P038	(See DAS-1-2700)	
6148K60P001	(See R1375-70)	
6148K60P002	(See R1375-2700)	
6148K60P003	(See R1391)	
6148K60P079	(See R1375-3308.34)	
6148K60P197	(See R1375-91.680)	
6148K60P198	(See R1375-500)	
6148K60P451	(See R1391-60K)	
6170K40G702	9-1-75	1
6170K62G700	8-1-30	1
	9-1-30	
6170K62G703	8-1-64	1
	9-1-75	
6288K11P002	3-1-27	2
6288K40P001	8-1-46	8
	9-1-54	
	9-1-69	
6288K42P057	(See 5133-12C)	
6288K60P001	(See 5103-25)	
6288K60P002	3-1-33	2
6311K12P002	(See 5427-3)	
6311K12P035	3-1-10	4
	3-1-16	
6368K60P001	5-1-13	1
6471K41P---	3-1-8	2
6509K60P001	3-1-10	4
	3-1-16	
6566K63P001	3-1-19	2
	3-1-20	
65854K90P036	(See 2N2714)	
6620K40G700	9-1--	1
6620K40G701	9-1--	1
6620K40G702	9-1--	1
6620K40G703	9-1--	1
6620K40G704	9-1--	1
6620K40G705	9-1--	1
6620K40G706	9-1--	1
6620K40G707	9-1--	1
6620K40G708	9-1--	1
6705K90P010	(See IN645)	
6707K10P092	(See IN758)	
6707K10P134	(See IN961)	
6707K60P010	(See N4-B)	
6707K60P011	(See N4)	
6845K61P001	2-2-19	3
6845K90P018	(See 2N1926)	
6847K90P007	(See CQT831)	
6854K90P052	(See 2N3417)	
6854K90P059	(See 2N3405)	
6854K90P060	(See 2N3390)	
6856K90P013	(See 2N2197)	
7113K46P001	3-1-31	2
732	2-3-3	1
7413K40P001	8-1-71	1
	9-1-85	
7413K41P001	8-1-17	2
	9-1-17	
	9-1-21	
7413K41P002	8-1-21	1
7413K41P003	8-1-22	1
	9-1-22	
7413K41P004	8-1-18E	
	9-1-18E	
7413K41P005	8-1-18D	1
	9-1-18D	
7413K46P002	3-1-32	1
7425K60G700	4-1-36	1
	5-1-37	
7486K41P001	8-1-69	2
	9-1-83	
7486K60P002	8-1-9	1
	9-1-9	
7489K60G700	8-1-52	1
	9-1-60	
7489K60G701	9-1-83	1
7581K40P001	8-1-34	2
	8-1-70	
	9-1-34	
	9-1-84	
7581K40P002	8-1-50	1
	9-1-58	
7639K40G700	2-1-8	1
7640K61P001	1-2-12	1
7671K41P003	8-1-43	2
	9-1-51	
7671K41P004	4-1-19	2
	4-1-21	
	5-1-20	
	5-1-22	
7762K92P006	(See S-153-125)	
7762K92P063	(See 111-51-01-062)	
7762K93P062	(See 121-51-00-040)	
7834K40P001	8-1-42	2
	9-1-42	
7834K40P002	8-1-39	8
	9-1-39	
	9-1-47	
	9-1-91	
	9-1-98	
7834K40P003	9-1-50	2
7834K40P004	8-1-9	1
	9-1-9	
7922K60P001	3-1-3	1
7922K62P001	3-1-20	1
7922K62P002	3-1-19	1
7923K46P001	4-1-17	1
	5-1-18	

PART NO.	FIG. & INDEX NO.	QTY PER INSTRUMENT
7923K47P001	8-1-12	1
	9-1-12	
7923K63P001	4-1-8	1
	5-1-8	
8037K60P001	9-1-79	1
8072K40P001	8-1-20	2
	9-1-20	
8089K65P001	6-1-6	1
8096K60G700	3-1-28	1
8096K61G700	3-1-29	1
8096K62G700	3-1-10	1
8096K62G701	3-1-16	1
8155K40P001	(See 11SM1-T)	
8159K40P002	(See SS-37)	
8159K40P005	(See SS-31)	
8243K60G700	4-1-13	1
	5-1-14	
8243K60G701	4-1-13	1
	5-1-14	
8245K40P001	4-1--	1
	5-1--	
8311K178003	(See 2106-04-00)	
8311K17P004	(See 2506-06-00)	
8311K17P006	(See 2106-06-00)	
8311K42P001	(See 2104-04-00)	
8311K42P001	10-1-4	6
	10-1-7	
8317K60P001	(See 926)	
8318K91P007	(See ST-SM-36TOR)	

PART NO.	FIG. & INDEX NO.	QTY PER INSTRUMENT
8600K43P001	2-3-7	1
8600K45P001	2-2-20	1
8600K62P006	(See MMC-1854)	
8600K68P003	(See MMC-1875)	
8611K40P001	(See AE7929)	
8615K60G700	2-1-17	1
8615K61G700	4-1-27	1
	5-1-28	
8615K61G701	4-1-27	1
	5-1-28	
8615K62G700	4-1-30	2
	5-1-31	
8690K60G700	3-1-15	1
8736K63P001	3-1-14	1
8900K43P001	8-1-11	2
	9-1-11	
8900K70P009	(See 2150)	
8912K40P001	9-1-86	1
8912K63P001	8-1-56	1
	9-1-64	
8953K60P002	3-1-12	1
9010K40G700	8-1-29	1
	9-1-29	
9010K40G701	8-1-63	1
	9-1-74	
9010K40G702	9-1-74	1
9087K43P003	11-1-2	1
9087K43P004	11-1-2	1
926	2-1-16	1

LOCATION	CAPABILITY DESIGNATION	AREA CODE	DAY PHONE	ADDRESS	DIAL COMM CODE
Albany, N. Y. 12205		518	459-4110 or 4111	1097 Central Avenue	8*231—1121
Allentown, Pennsylvania. 18103		215	435-9501	668 East Highland St.	8*243—7287
Appleton, Wisc. 54910		414	734-6586	P.O. Box 83, Appleton, Wisc. 664 Valley Rd., Menasha, Wisc.	Not on DIAL COMM
(Atlanta) Chamblee, Ga. 30005	ABC	404	457-2501	5035 Peachtree Industrial Blvd.	8*281—7675
Baltimore, Md. 21230	AC	301	Mulberry 5-6500	920 East Fort Ave.	8*272—8200
Birmingham, Ala. 35211		205	State 1-4126	P.O. Box 3687, 1500 Mims Ave., S.W.	8*283—8101
(Boston) Medford, Mass. 02155	ABCD	617	Export 6-9600	3960 Mystic Valley Parkway	8*261—3930
Buffalo, N. Y. 14211	A	716	822-5849/5850	318 Urban St.	8*252—2257
Charleston, W. Va. 25328	AC	304	346-9428	306 MacCorkle Ave., S.E.	8*331—3140
Charlotte, N. C. 28208		704	334-1644	2328 Thrift Rd.	8*282—6118
Chicago, Ill. 60632	ABCD	312	Lafayette 3-4231	4360 West 47th St.	8*321—1330
Cincinnati, Ohio 45202	AC	513	421-1455	444 West Third St.	8*333—2331
Cleveland, Ohio 44125	AC	216	883-1000	4477 East 49th St.	8*343—3121
Columbus, Ohio 43223		614	274-1131	2128 Eakin Rd.	8*333—7121
Corpus Christi, Texas 78401		512	Tulip 2-3611	115 Waco St.	Not on DIAL COMM
Dallas, Texas 75235	ABCD	214	Fleetwood 2-7587	3202 Manor Way	8*352—2327
(Davenport) Bettendorf, Iowa 52722		319	355-2131	1025 State St.	8*322—8145 or—8146
Denver, Colo. 80205	AB	303	222-3687	3353 Larimer St.	8*353—6306
Detroit, Mich. 48202	ABC	313	872-2600	5950 Third Ave.	8*362—4381
(Duluth) West Duluth, Minn. 55807		218	628-2223	P.O. Box 7198	8*326—1244
Flint, Mich. 48505		313	785-7839	1506 East Carpenter Road	8*361—3911
Ft. Wayne, Ind. 46803		219	742-9454	1731 Edsall Ave.	8*322—2674
Houston, Texas 77020	AC	713	Walnut 3-2551	5534 Harvey Wilson Drive	8*354—9411 or—9412
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